SIEMENS

Room thermostat with KNX communications RDG100KN

Basic Documentation

Edition: 1.0

CE1P3191en
22 Jun 2010

Building Technologies

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1. About this document

1.1 Revision history

Edition	Date	Changes	Section	Pages
1.0	**07 Jun 2010**	**First edition**		

1.2 Reference documents

Subject	Ref	Doc No.	Description
Room thermostats with KNX communications, RDG100KN	[1]	CE1N3191	Data Sheet
	[2]	CE1B3191	Operating Instructions
	[3]	CE1M3191	Mounting Instructions
KNX Manual	[4]	Handbook for Home and Building Control – Basic Principles (www.knx.org/uk/news-press/publications/publications/)	
Synco and KNX (see www.siemens.com/synco)	[5]	CE1N3127	KNX bus, Data Sheet
	[6]	CE1P3127	Communication via the KNX bus for Synco 700, 900 and RXB/RXL, Basic Documentation
	[7]	XLS template in HIT	Planning and commissioning protocol, communication Synco 700
	[8]	CE1N3121	RMB395 central control unit, Data Sheet
	[9]	CE1Y3110	KNX S-mode data points
	[10]	--	Product data for ETS3
	[11]	CE1J3110	ETS product data compatibility list
	[12]	0-92168en	Synco Application Manual
DESIGO engineering documents	[13]	CM1Y9775	DESIGO RXB integration – S-mode
	[14]	CM1Y9776	DESIGO RXB / RXL integration – Individual Addressing
	[15]	CM1Y9777	Third-party integration
	[16]	CM1Y9778	Synco integration
	[17]	CM1Y9779	Working with ETS

1.3 Before you start

1.3.1 Copyright

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1.3.2 Quality assurance

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- The contents of this document is checked at regular intervals
- Any corrections necessary are included in subsequent versions
- Documents are automatically amended as a consequence of modifications and corrections to the products described

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1.4 Target audience, prerequisites

This document assumes that users of the RDG KNX thermostats are familiar with the ETS3 Professional and/or Synco ACS700 tools and able to use them.

It also presupposes that these users are aware of the specific conditions associated with KNX.

In most countries, specific KNX know-how is conveyed through training centers certified by the KNX Association (see www.konnex.org/).

For reference documentation, see section 1.2.

1.5 Glossary

The inputs, outputs and parameters of an application can be influenced in various ways. These are identified by the following symbols in this document:

ETS3 Professional

Parameters identified by this symbol are set using ETS3 Professional.

ACS Service

Parameters identified by this symbol are set using the ACS Service tool.

ACS Operating

Parameters identified by this symbol can be monitored using the ACS Operating tool.

Note!

Setting RDG KNX parameters is only supported by the following tool versions:
– ETS3f or higher
– ACS700 version 5.11 or higher

Inputs and outputs identified by this symbol communicate with other KNX devices. They are called communication objects (CO).

The communication objects of the RDG KNX thermostats work partly in S-mode, partly in LTE mode, and partly in both. These objects are described accordingly.

A list of the parameters is shown in section 3.13.

2. Summary

2.1 Types

Product no.	Stock no.	Features				
		Operating voltage	Number of control outputs			Backlit LCD
			ON/OFF	PWM	3-pos	
RDG100KN	S55770-T163	AC 230 V	3 [1)]	2 [1)]	2 [1)]	✓

1) Selectable: ON/OFF, PWM or 3-position (triac outputs)

2.2 Ordering

- When ordering, please indicate both product no. / stock no. and name:
  E.g. **RDG100KN / S55770-T163 room thermostat**

- Order valve actuators separately

2.3 Functions

Use

Fan coil units via ON/OFF or modulating control outputs:
- 2-pipe system
- 2-pipe system with electric heater
- 2-pipe system and radiator / floor heating
- 4-pipe system
- 4-pipe system with electric heater
- 2-stage heating or cooling system

Chilled / heated ceilings (or radiators) via ON/OFF or modulating control outputs:
- Chilled / heated ceiling
- Chilled / heated ceiling with electric heater
- Chilled / heated ceiling and radiator / floor heating
- Chilled / heated ceiling, 2-stage cooling or heating

The room thermostats are delivered with a fixed set of applications.
The relevant application is selected and activated during commissioning using one of the following tools:
- Synco ACS
- ETS3 Professional
  Parameter and application download with ETS3 will be implemented later
- Local DIP switch and HMI

Features

- Operating modes: Comfort, Economy (Energy Saving) and Protection
- ON/OFF, PWM or 3-position control outputs (triac)
- Output for 3-speed or 1-speed fan
- Automatic or manual heating / cooling changeover
- Backlit display
- AC 230 V operating voltage

Functions

- Room temperature control via built-in temperature sensor or external room temperature / return air temperature sensor
- Changeover between heating and cooling mode (automatic via local sensor or bus, or manually)
- Selection of applications via DIP switches or commissioning tool (ACS700).
  Parameter and application download with ETS3 will be implemented later
- Select operating mode via operating mode button on the thermostat
- Temporary Comfort mode extension
- 1- or 3-speed fan control (automatically or manually)
- Display of current room temperature or setpoint in °C and/or °F
- Minimum and maximum limitation of room temperature setpoint
- Button lock (automatically or manually)
- 3 multifunctional inputs, freely selectable for:
  – Operating mode switchover contact (keycard, window contact, etc.)
  – Sensor for automatic heating / cooling changeover
  – External room temperature or return air temperature sensor
  – Dew point sensor
  – Electric heater enable
  – Fault input
  – Monitor input for temperature sensor or switch state
- Advanced fan control function, e.g. fan kick, fan start, selectable fan operation (enable, disable or depending on heating or cooling mode)
- “Purge” function together with 2-port valve in a 2-pipe changeover system
- Reminder to clean fan filters
- Floor heating temperature limitation
- Reload factory settings for commissioning and control parameters

2.4 Integration via KNX bus

The RDG room thermostats can be integrated as follows:

- Integration into Synco 700 system via LTE mode (easy engineering)
- Integration into Synco living via group addressing (ETS3)
- Integration into DESIGO via group addressing (ETS3) or individual addressing
- Integration into third-party systems via group addressing (ETS3)

The following KNX functions are available:

- Central time program and setpoints, e.g. when using the RMB795 central control unit
- Outside temperature or time of day via bus displayed on thermostat
- Remote operation and monitoring, e.g. using the RMZ792 bus operator unit
- Remote operation and monitoring with web browser using the OZW772 or OZW775 web server
- Maximum energy efficiency due to exchange of relevant energy information, e.g. with Synco 700 controllers (e.g. heating demand, cooling demand)
- Alarming, e.g. external fault contact, condensation, clean filter, etc.
- Monitoring input for temperature sensor or switch

Engineering and commissioning can be done using…

– local DIP switches / HMI
– Synco ACS700 service tool
– ETS3 Professional
Parameter and application download with ETS3 will be implemented later

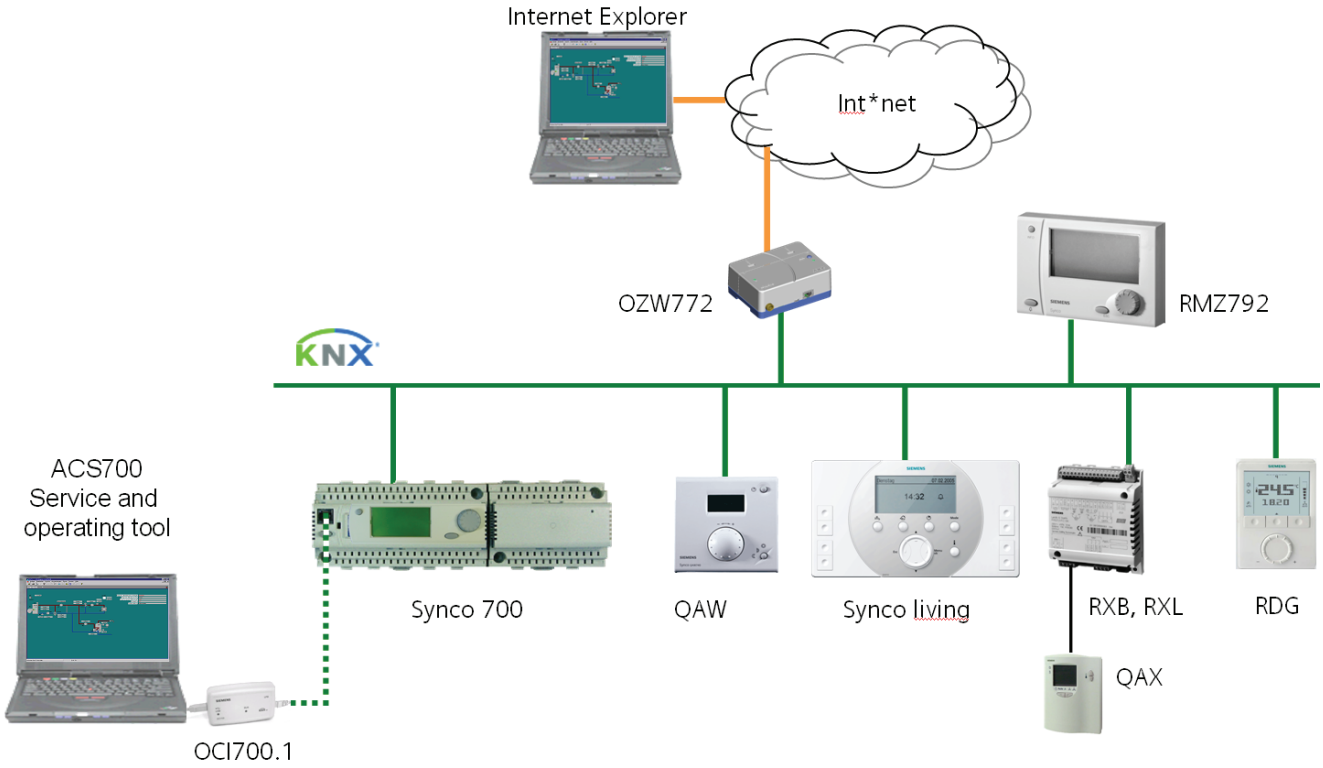
Synco 700

The RDG room thermostats are especially tailored for integration into the Synco 700 system and operate together in LTE mode. This extends the field of use of Synco for individual room control in conjunction with fan coil units, VAV, chilled ceilings and radiators.

Synco living

Thanks to S-mode extension to the QAX910 central apartment unit, communicating room thermostats can be easily integrated into Synco living systems. Using the S-mode data points of the central apartment unit, additional room information can be exchanged with the room thermostat via KNX TP1 (RF function is not available on the room thermostats). To make the integration, the ETS3 engineering tool is required.

Synco topology



Legend:	Synco 700	Building automation and control system (BACS)
	Synco living	Room automation and control system
	RDG..., RDF…, RDU…	Room thermostats
	OZW772 (or OZW775)	Web server
	RMZ792	Bus operator unit
	QAW...	Room unit
	ACS700	Service tool using OCI700.1 (OCI700.1 is delivered with a service cable which can be plugged into the service connector on a Synco controller)
	RXB, RXL	Room controllers
	QAX	Room unit for RXB / RXL room controllers

DESIGO and third-party systems

The RDG KNX devices can be integrated into the Siemens building automation and control systems (BACS) DESIGO or into 3rd-party systems. For integration, either S-mode (group addressing) or individual addressing can be used. The workflow for integration into DESIGO is the same as with standard KNX devices.

2.5 Equipment combinations

	Description	Product no.	Data sheet
	Cable temperature sensor	**QAH11.1**	1840
	Room temperature sensor	**QAA32**	1747
	Condensation detector / extension module	**QXA2000 / QXA2001 / AQX2000**	1542
On / off actuators	Electromotoric ON/OFF actuator	**SFA21...**	4863
	Electromotoric ON/OFF valve and actuator (only available in AP, UAE, SA and IN)	**MVI… / MXI…**	4867
	Zone valve actuator (only available in AP, UAE, SA and IN)	**SUA…**	4830
ON/OFF and PWM actuators *)	Thermal actuator (for radiator valves)	**STA21...**	4893
	Thermal actuator (for small valves 2.5 mm)	**STP21...**	4878
3-position actuators	Electrical actuator, 3-position (for radiator valves)	**SSA31...**	4893
	Electrical actuator, 3-position (for small valves 2.5 mm)	**SSP31…**	4864
	Electrical actuator, 3-position (for small valves 5.5 mm)	**SSB31...**	4891
	Electrical actuator, 3-position (for small valve 5.5 mm)	**SSD31...**	4861

*) Note: With PWM control, it is not possible to ensure exact parallel running of 2 or more thermal actuators. If several fan coil systems are controlled by the same room thermostat, preference should be given to motorized actuators with ON/OFF or 3-position control

2.6 Accessories

Description	Product no / Stock no.	Data sheet
Changeover mounting kit (50 pcs / package)	**ARG86.3**	N3009
Adapter plate 120 x 120 mm for 4“ x 4“ conduit boxes	**ARG70**	N3009
Adapter plate 112 x 130 mm for surface wiring	**ARG70.2**	N3009
KNX power supply 160 mA (Siemens BT LV)	**5WG1 125-1AB01**	--
KNX power supply 320 mA (Siemens BT LV)	**5WG1 125-1AB11**	--
KNX power supply 640 mA (Siemens BT LV)	**5WG1 125-1AB21**	--

3. Functions

3.1 Temperature control

General note: Parameters

Setting of the control parameters (P01, etc., mentioned throughout the document) is described in section 3.13.

Temperature control

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1), and maintains the setpoint by delivering actuator control commands to heating and/or cooling equipment. The following control outputs are available:

- ON/OFF control (2-position)
- Modulating PI/P control with PWM output
- Modulating PI/P control with 3-position control output

The switching differential or proportional band is 2 K for heating mode and 1 K for cooling mode (adjustable via parameters P30 and P31).
The integral action time for modulating PI control is 5 minutes (adjustable via parameter P35).

Display

The display shows the acquired room temperature or the Comfort setpoint, selectable via parameter P06. The factory setting displays the current room temperature. Use parameter P04 to display the room temperature or setpoint in °F rather than °C as needed.

KNX
Room temperature

The acquired room temperature (internal or external sensor) is also available as information on the bus.

/

- With automatic changeover or continuous heating / cooling, symbols / indicate that the system currently heats or cools (heating or cooling output is activated).
- With manual changeover (P01 = 2), symbols / indicate that the system currently operates in heating or cooling mode. Thus, the symbols are displayed even when the thermostat operates in the neutral zone.
  Symbols / indicate that the system currently heats or cools (heating or cooling output is activated).

Concurrent display of °C and °F

Concurrent display of the current temperature or setpoint in °C and °F (parameter P07 = 1) is possible on the thermostats.

KNX
Outside temperature via bus

The outside temperature can be displayed on the room thermostat by setting parameter P07 = 2. This temperature value has only information character.
In LTE mode, the outside temperature can only be received on outside temperature zone 1.
In S-mode, the corresponding communication object needs to be bound with a KNX sensor device.

KNX
Time of day via bus

Time of day via bus can be displayed on the room thermostat by setting parameter P07 = 3 or 4. The display format is either in 12- or in 24-hour format.
The information can be received from a Synco controller with time master functionality or any other KNX device if the corresponding communication object is bound.

3.2 Operating modes

The thermostat's operating mode can be influenced in different ways (see below). Specific heating and cooling setpoints are assigned to each operating mode.

KNX

Room operating mode: State

The thermostat sends the effective room operating mode on the bus.

The following operating modes are available:

Auto Timer

In Auto Timer mode the room operating mode is commanded via bus.
Auto Timer is replaced by Comfort when no time schedule via bus is present

Comfort

In Comfort mode, the thermostat maintains the Comfort setpoint. This setpoint can be defined via parameters P8, P9 and P10.
It can be locally adjusted via the rotary knob or via bus.
In Comfort mode, the fan can be set to automatic or manual fan speed: Low, medium or high.

Economy

The setpoints (less heating and cooling than in Comfort mode) can be defined via parameters P11 and P12.
The thermostat switches to Economy mode when...

- the operating mode button is pressed (only possible if parameter P02 is set to 2)
- Economy is sent via bus
- an operating mode switchover contact (e.g. keycard contact presence detector, window contact) is active.
  The contact can be connected to digital input D1 or multifunctional input X1, X2.
  Set parameter P38 / P40 / P42 to 3 (P02 is irrelevant) *)
- "Window state" is sent via bus, e.g. from a KNX switch or a KNX presence detector (P02 is irrelevant) *)

KNX

Room operating mode: Window state

Note: *) Operating mode switchover: *Only one input source must be used, either local input X1/X2/D1or KNX bus.*
User operations are ineffective and “OFF” is displayed if the operating mode switchover contact is active, or if "Window state" is sent via bus.

Protection

In Protection mode, the system is...

- protected against frost (factory setting 8 °C, can be disabled or changed via P65)
- protected against overheating (factory setting OFF, can be enabled or changed via P66)

No other operating mode can be selected locally if Protection mode is commanded via bus. and are displayed.

3.2.1 Different ways to influence the operating mode

Source for change of operating mode

ACS Service

ACS Operating

The operating mode can be influenced by different interventions.
The source of the effective room operating mode state can be monitored using the "Cause" diagnostic data point in the ACS700 tool, operator unit RMZ792 or web server OZW772 / 775.

Source	Description	Value of DP "Cause"
Local operation via left button	• Operating mode is not Auto Timer • No time schedule via bus	Room operating mode selector (preselection)
	• Temporary Comfort extension is active	“Timer” function
	• Operating mode switchover contact	Room operating mode contact
Bus command KNX Room op. mode	• "Window state" sent via bus	Room operating mode contact
	• Time schedule available via bus → local operating mode is set to Auto Timer • Time schedule sends Protection mode via bus → operating mode cannot be changed locally	Time switch

Priority of operating mode interventions

The following table shows the priorities of different interventions.
A lower number means a higher priority.

Priority	Description	Remark
①	Commissioning	In parameter setting mode (highest priority), you can always command an operating mode independent of all other settings or intervention via bus and local input.
②	Protection mode via bus from time schedule	Protection mode, sent by a time schedule, has priority 2. It cannot be overridden by the user nor by an operating mode switchover contact.
③	Operating mode switchover contact	If the contact is closed, the operating mode changes to Economy. This overrides the operating mode on the thermostat.
③	"Window state" via bus	"Window state" sent via bus has the same effect as the operating mode switchover contact.
		Note: Only one input source must be used, either local input X1/X2/D1or KNX bus.
④a	Operating mode button	The user can switch the operating mode using the operating mode button.
④b	Operating mode via bus	The operating mode can be changed via bus
④c	Temporary extended Comfort mode via operating mode button	The operating mode can be temporarily set from Economy to Comfort by pressing the operating mode button, if... – Economy was sent via bus – extended Comfort period >0 (parameter P68)
		The last intervention wins, either locally or via bus
⑤	Time schedule via bus	The operating mode sent via bus can be overridden by all other interventions. *Exception: Protection mode has priority 2.*

Auto Timer mode with time schedule via bus

If a time schedule via bus is present, e.g. from central control unit, then the Auto Timer mode is active. The thermostat automatically changes between Comfort and Economy according to the time schedule via bus.
The display shows the Auto Timer mode symbol along with the symbol for the effective room operating mode (Comfort or Economy).
By pressing the operating mode button, you can change to another operating mode.
Automatic fan is the default fan speed in Auto Timer mode.

Behavior when bus sends new operating mode

Each time the time schedule sends a new operating mode (switching event), the operating mode of the thermostat is set back to Auto Timer mode. This is to assure that the room temperature is maintained according to the time schedule.

Precomfort via bus

If the time schedule sends Precomfort mode, then this mode will be transformed either into Economy (factory setting) or Comfort (selectable via parameter P88).

Behavior when bus sends Protection

No intervention is possible neither by the user nor by an operating mode switch-over contact, if Protection mode is set by the time schedule. OFF flashes on the display when the user presses a button.

Availability of Economy mode

The operating mode can be selected locally via the operating mode button.
The behavior of the operating mode button (user profile) can be defined via parameter P02, factory setting is P02 = 1.

P02	Without time schedule	With time schedule via bus	Description
1	→	→	• Switching manually between **2** modes, Economy is not available (factory setting) • Suited for hotel guest rooms or commercial buildings. • If a time schedule via bus is available, then the Comfort mode can be temporarily extended (see below)
2	→ →	→ → →	• Switching manually between **3** modes • Suited for homes and rooms where manual switching to Economy mode is desired

Operating mode switchover contact (window contact)

The thermostat can be forced into Economy mode (e.g. when a window is opened, when a presence detector signals "no one present", when the keycard of a hotel room is withdrawn, etc). The contact can be connected to digital input D1 (or multi-functional input X1, X2). Set parameter P42 (P38, P40) to 3.

KNX

Room operating mode: Window state

The function is also available via the KNX signal "Window state", e.g. from a KNX switch or a KNX presence detector.

Note: Only one input source must be used, either local input X1/X2/D1or KNX bus. User operations are ineffective and "OFF" is displayed if the operating mode switchover contact is active, or if "Window state" is sent via bus.

Temporary timer to extend the Comfort mode

Comfort mode can be temporarily extended (e.g. working after business hour or on weekends) when the thermostat is in Economy mode. The operating mode button switches the operating mode back to Comfort for the period preset in P68.
Press the operating mode button again to stop the timer.

The following conditions must be fulfilled:

- The operating mode switchover contact is closed (connected to input X1, X2, D1, parameter P38, P40, P42 set to 3 or a KNX switch, KNX presence detector, etc. via bus)
  or
  mode selection via operating mode button is set to “Protection-Auto” (P02 = 1) and the time schedule via bus is Economy
- Parameter P68 (extend Comfort period) is greater than 0

During the temporary Comfort mode extension, symbol ⌛ appears.

If parameter P68 (extend Comfort period) = 0, extended Comfort cannot be activated; pressing the left button will switch the thermostat to Protection.
If the operating mode switchover contact is active, pressing the left button will show “OFF” (blinking).

Timer for extension of presence / absence

The effective room operating mode can be forced temporarily into Comfort or Economy / Protection mode. The time period is adjusted via the rotary knob:

- Extend presence: Set the device to Comfort mode for the selected time period
- Extend absence: Set the device to Economy / Protection mode for the selected time period

To activate the function, keep the left button pressed and, within 3 seconds, turn the rotary knob…

- clockwise for extended presence
- counterclockwise for extended absence

The rotary knob adjusts the time period:

- Extend presence: 0:00…+9:30 in steps of 30 minutes; symbol ☼ appears
- Extend absence: 0:00…–9:30 in steps of 30 minutes; symbol ☾ or ⌂ appears

During the extended presence / absence period, the sandglass symbol ⌛ appears.

Function if no time schedule is received via bus

User profile for operating mode (selected via P02)	**Operating mode when activating function**	**Function**	**Operating mode during function**	**Operating mode at the end of function**
P02 = 1 →☼→⌂ →☼ ♨→⌂→☼☼	Comfort	Extension	Comfort	Protection
	Comfort	Absence	Protection	Comfort
	Protection	Not available	-	-
P02 = 2 →☼→☾ →☼♨→☾♨ →⌂ →☼☼→☾☼	Comfort	Extension	Comfort	Economy
	Comfort	Absence	Economy	Comfort
	Economy	Extension	Comfort	Economy
	Economy	Absence	Economy	Comfort
	Protection	Not available	-	-

Function with time schedule via bus

User profile for operating mode (selected via P02)	**Operating mode when activating function**	**Function**	**Operating mode during function**	**Operating mode at the end of function**
P02 = 1 →Auto→☼ →Auto→☼≋→⌂→Auto→☼☼	Auto	Extension	Comfort	Auto
	Auto	Absence	Protection	Auto
	Comfort	Extension	Comfort	Auto
	Comfort	Absence	Protection	Auto
	Protection	Not available	-	-
P02 = 2 → Auto→☼→☾ → (Auto)	Economy	Extension	Comfort	Auto
	Economy	Absence	Economy	Auto
	Protection	Not available	-	-

3.2.2 Communication examples

The following examples show two typical applications of a central time schedule in conjunction with local control of the room operating mode.
The room operating mode in rooms 1…2 of a building is determined by the time schedule. Window contacts are fitted in all rooms.

The following conditions are specified:

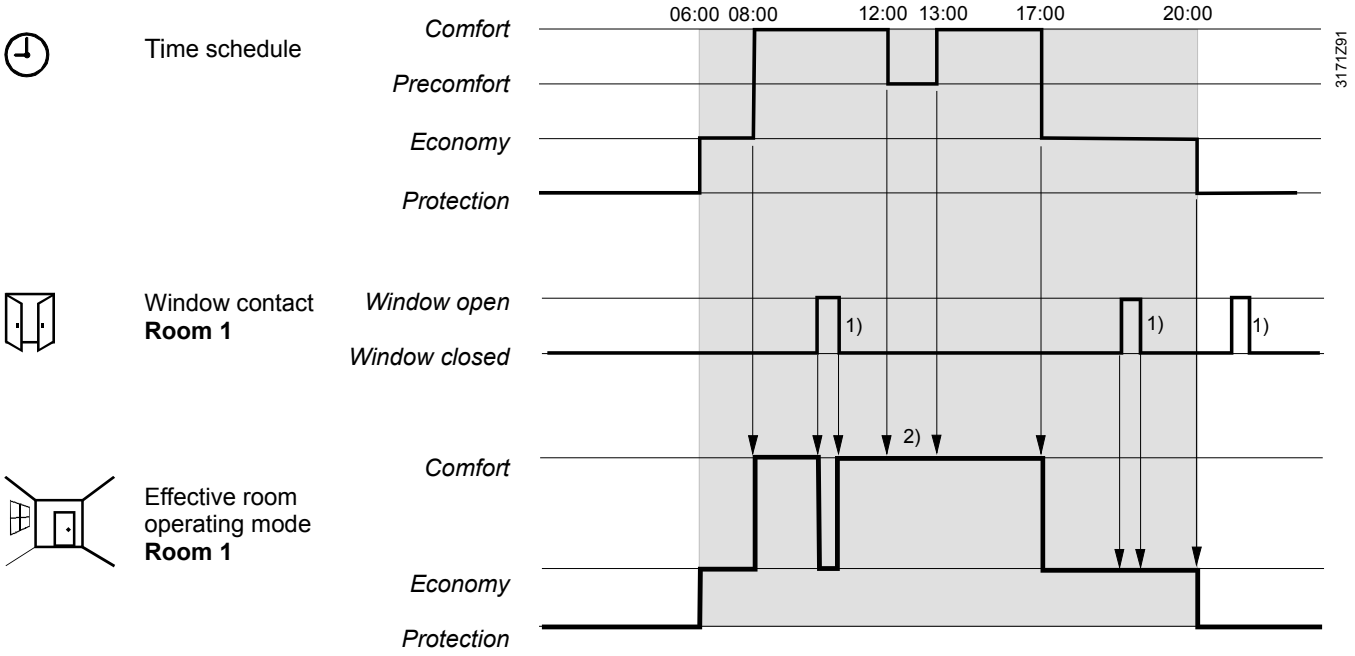
The rooms are used and controlled by the time schedule as follows:
– Night setback from 17:00 to 08:00 (Economy)
– Protection from 20:00 to 06:00
– Lunch break from 12:00 to 13:00 (Precomfort)

The substitution (parameter P88) for Precomfort via bus is set on the thermostats as follows:
– Room 1: Comfort (1)
– Room 2: Economy (0)

Example 1

Operating mode switchover

In **room 1,** the window is opened briefly, once in the morning, once in late afternoon and once at night (1). Only the opening in the morning has a direct impact on the effective room operating mode.
During lunch break, the time schedule changes to Precomfort. The mode remains in Comfort as set by parameter “Transformation Precomfort” (P88 = 1).



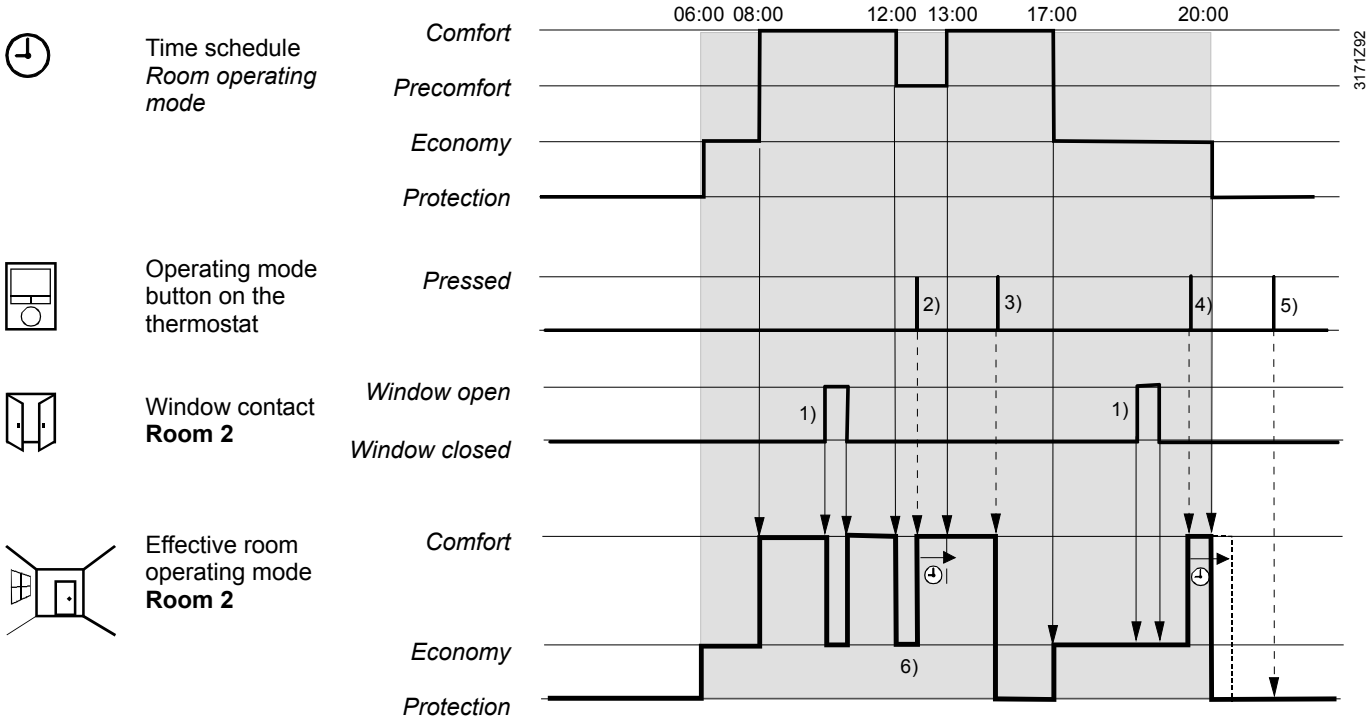
Example 2

Interaction of user operation (operating mode button) and central time schedule

In **room 2,** the window is opened briefly, once in the morning and once at night (1). Only the opening in the morning has a direct impact on the effective room operating mode.

With the operating mode button, the operating mode can be changed between OFF and Auto or temporary Comfort extension respectively.

- During lunch break, the time schedule changes to Precomfort. The mode of the thermostat changes to Economy as set by parameter “Transformation Precomfort” (P88 = 0) (6)
- During lunch break, the user changes the operating mode to Comfort (temporary Comfort extension) by pressing the operating mode button (2). At 13:00, the timer is reset due to mode change of the central time schedule
- In the afternoon, the user switches the thermostat off by pressing the operating mode button (3). At 17:00 the user setting is reset to Economy by the time schedule
- At 19:30, the user again extends the Comfort mode (4). At 20:00, the timer is reset by the time schedule
- After 20:00, pressing the operating mode button has no effect, as the central time switch sets the thermostat to Protection (5)



3.3 Room temperature setpoints

3.3.1 Description

Comfort mode ☼

The factory setting for the Comfort basic setpoint is **21 °C** and can be changed in the thermostat's EEPROM via parameter P08 or via bus with communication object " Comfort basic setpoint". The last intervention always wins.

The Comfort setpoint can be adjusted via the rotary knob,
or via bus from a remote device like a touchpanel, operating unit, etc.
The last intervention always wins.

Temporary setpoint

If the "Temporary setpoint" function is enabled via parameter P69, the Comfort setpoint adjusted via the rotary knob, the or via bus is set back to the Comfort basic setpoint stored in P08 when the operating mode changes.

Setpoint limitation

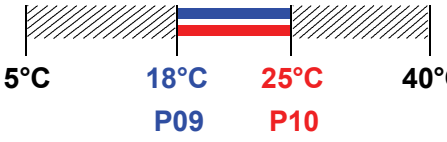
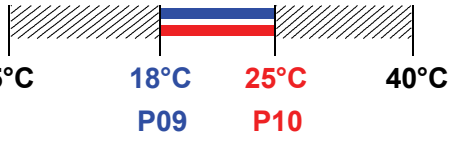
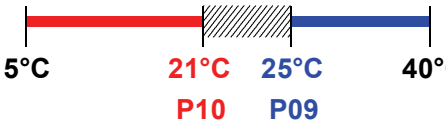
For energy saving purposes, the setpoint setting range can be limited to minimum (P09) and maximum (P10).

P09 < P10

- If the minimum limit **P09 is set lower** than the maximum limit P10, both heating and cooling are adjustable between these 2 limits

P09 ≥ P10

- For heating **or** cooling applications (e.g. 2-stage):
  – The setting range in cooling mode is from **P09…40 °C** in place of 5…40 °C
  – The setting range in heating mode is from **5…P10 °C** in place of 5…40 °C
- For heating **and** cooling applications (e.g. 4-pipe):
  – **P09** is the setpoint for cooling and **P10** the setpoint for heating
  – The setpoint can no longer be adjusted via the rotary knob

Examples	2-pipe heating OR cooling	4-pipe heating AND cooling
P09 < P10	 Cooling setpoint adjustable 18…25 °C Heating setpoint adjustable 18…25 °C	 Cooling setpoint adjustable 18…25 °C Heating setpoint adjustable 18…25 °C
P09 ≥ P10	 Cooling setpoint adjustable 25…40 °C Heating setpoint adjustable 5…21 °C	Cooling fixed = 25 °C (P09) Heating fixed = 21 °C (P10)

Economy mode ☾

Use control parameters P11 and P12 to adjust the Economy mode setpoints.
The heating setpoint is factory-set to **15 °C**, and the cooling setpoint to **30 °C**.

Protection mode

Use control parameters P65 and P66 to adjust the Protection mode setpoints.
The heating setpoint is factory-set to **8 °C** (frost protection) and to **OFF** for cooling.

Caution ⚠

If a setpoint (Economy or Protection) is set to OFF, the thermostat does not control the room temperature in the corresponding mode (heating or cooling).
This means no protective heating or cooling function and thus risk of frost in heating mode or risk of overtemperature in cooling mode!

The Economy setpoints are accessible at the service level (P11, P12); the Protection setpoints at the expert level (P65, P66).

3.3.2 Setting and adjusting setpoints

Room temperature setpoints can be
– set during commissioning
– adjusted during runtime

KNX

Comfort basic setpoint
Comfort setpoint

The source can be
– the local HMI
– a tool
– a central control unit

The thermostat stores the setpoints
– in EEPROM in the form of parameters
– in the runtime memory

The table below shows the interrelations:

	Setpoint setting		**Stored in EEPROM of thermostat**
Commissioning **– HMI** **– Tool download**	**Input LTE mode**	**Input S-mode**	
Comfort basic setpoint Dead zone Comfort **1)**	Setpoints Heating Setpoints Cooling	Comfort basic setpoint	P08 Comfort basic setpoint P33 Dead zone Comfort 1)
Setpoint Economy Heating Setpoint Economy Cooling	Setpoints Heating Setpoints Cooling		P11 Economy Heating P12 Economy Cooling
Setpoint Protection Heating Setpoint Protection Cooling			P65 Protection Heating P66 Protection Cooling

Current runtime setpoints in thermostat	**Setpoint adjustment**			**New current runtime setpoints in thermostat**
	Input LTE mode 2)	**Input S-mode 3)**	**Local operation 3)**	
Comfort setpoint	Setpoint shift H Setpoint shift C	Comfort setpoint	Rotary knob	Comfort setpoint
Economy Heating Economy Cooling	Setpoint shift H Setpoint shift C			Economy Heating Economy Cooling
Protection Heating Protection Cooling				Protection Heating Protection Cooling

Effective room operating mode → **Current setpoint** (used by the thermostat for temperature control)

1) Only required for heating AND cooling applications (see section 3.6.10)
2) LTE mode: **the shift is added** to the local shift
3) S-Mode: **the last intervention wins**, either S-Mode input or local operation

Current setpoint

The current setpoint (used by the thermostat for temperature control) is available on the bus for use in the central control unit.

General notes:

- The supported communication objects are different in LTE mode and S-mode
- Changes via the local HMI or via tool have the same priority (last always wins)
- Setting the Comfort basic setpoint will reset the runtime Comfort setpoint to the basic setpoint

Notes on setpoint adjustment (LTE mode with Synco only)

- Central setpoint shift is used for summer / winter compensation in particular
- Setpoint shift does not affect the setpoints stored in parameters P08, P11, P12, P33
- Local shift and central shift are added together
- Applies only to Comfort and Economy setpoints; Protection setpoints are not shifted centrally
- The resulting (current) setpoint heating and cooling is limited by the Protection setpoint; if Protection setpoint is OFF, then minimum 5 °C and maximum 40 °C are used
- The resulting setpoints for cooling and heating of the same operating mode have a minimum distance of 0.5 K between them
- The result of local and central shift, together with the room operating mode, is used by the thermostat for temperature control (current setpoint)

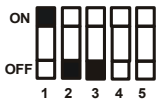
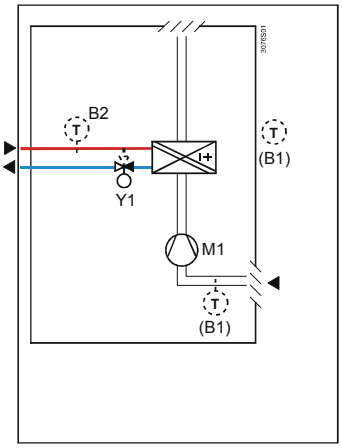
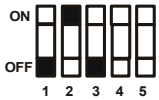
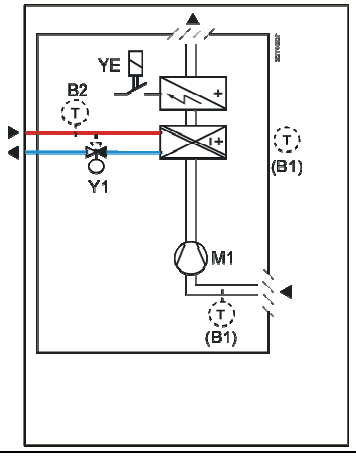
3.4 Applications overview

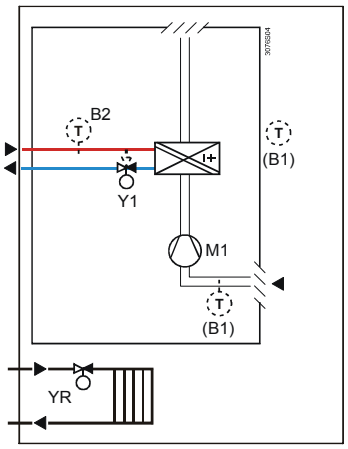
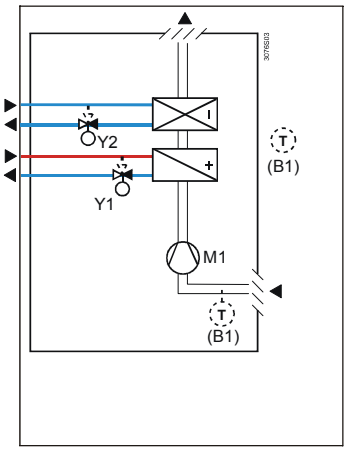
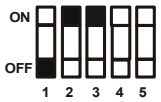
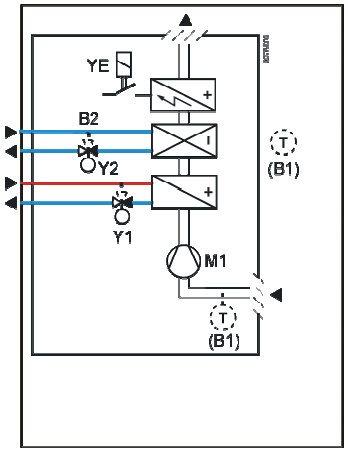
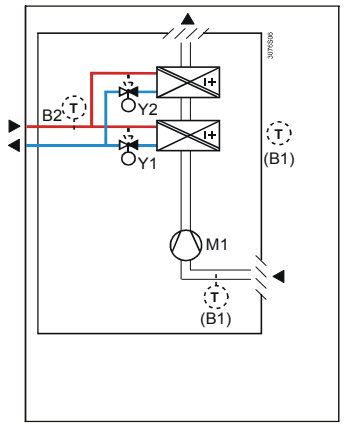
The thermostats support the following applications, which can be configured using the DIP switches at the rear of the unit or a commissioning tool.

DIP switches 1...3 need to be set to OFF (remote configuration, factory setting) to select an application via commissioning tool.

The tool offers the applications printed in bold text (basic applications).

For universal applications (chilled ceiling, etc.), refer to section 3.6.9.

Application	DIP switches	Diagram
Remote configuration via commissioning tool (factory setting) • Synco ACS • ETS3 professional (*Parameter and application download with ETS3 will be implemented later)*		
Heating or cooling • **2-pipe fan coil unit** (heating **or** cooling) • Chilled / heated ceiling (heating **or** cooling)		
Heating or cooling with electric heater • **2-pipe fan coil unit and electric heater** (heating **or** cooling) • Chilled / heated ceiling and electric heater (heating **or** cooling)		

Heating or cooling and radiator / floor heating • **2-pipe fan coil unit and radiator** (heating **or** cooling) • Chilled / heated ceiling and radiator (heating **or** cooling)		
Heating and cooling • **4-pipe fan coil unit** (heating **and** cooling) • Chilled ceiling and radiator (heating **and** cooling)		
Heating and cooling with electric heater • **4-pipe fan coil unit with electric heater** (heating **and** cooling)		
2-stage heating or cooling • **2-stage fan coil unit** (heating **or** cooling) • 2-stage chilled / heated ceiling (heating **or** cooling)		

Key

Y1	Heating or heating / cooling valve actuator	M1	1-speed or 3-speed fan
Y2	Cooling valve actuator	B1	Return air temperature sensor or external room temperature sensor (optional)
YE	Electric heater	B2	Changeover sensor (optional)

3.5 Additional functions

Heating / cooling changeover via bus

The heating / cooling changeover information can be received via bus. This is only possible if the control sequence is set to automatic heating / cooling changeover (parameter P01 = 3) and no local input X1, X2, D1 is assigned with this function.

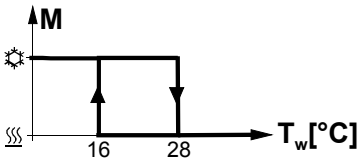
KNX

Heating/cooling changeover

In the absence of the required information (e.g. due to problems with data communication, power failure, etc.), the thermostat operates in the last valid room operating mode (heating or cooling).

Automatic heating / cooling changeover via changeover sensor

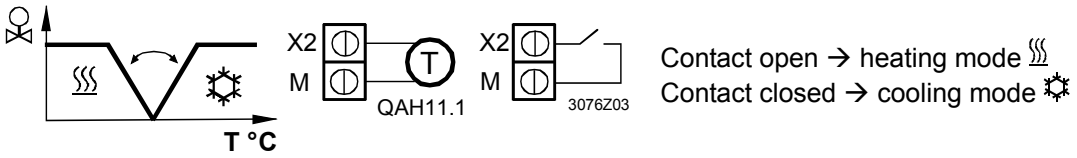
If a cable temperature sensor (QAH11.1 + ARG86.3) is connected to X1 / X2, and parameter P38 / P40 is =2, the water temperature acquired by the changeover sensor is used to change over from heating to cooling mode, or vice versa. When the water temperature is above 28 °C (parameter P37), the thermostat changes over to heating mode, and to cooling mode when below 16 °C (parameter P36).
If the water temperature is between the 2 changeover points immediately after power-up, the thermostat starts in heating mode.
The water temperature is acquired at 30-second intervals and the operating state is updated accordingly.



M Operating mode
T_w Water temperature
Cooling mode
Heating mode

Changeover switch

The QAH11.1 cable temperature sensor for automatic heating / cooling changeover can be replaced by an external switch for manual, remote changeover:



The sensor or switch can be connected to input terminal X2 or X1 or D1 (switch only), depending on the commissioning of the inputs (P38, P40, P42).
See also section 3.9 “Multifunctional input”.

Manual heating / cooling changeover

If manual heating / cooling changeover is commissioned (P01 = 2), then heating / cooling mode cannot be changed via bus / changover sensor / switch; it will remain in the last mode as selected locally via button.

External / return air temperature sensor

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1) connected to multifunctional input X1 or X2.
Inputs X1 or X2 must be commissioned accordingly. See section 3.9 “Multi-functional input”.

Purge function

The changeover sensor ensures changeover from heating to cooling mode based on the acquired water temperature. We recommend activating the “Purge” function (parameter P50) with 2-port valves. This function ensures correct acquisition of the medium temperature even if the 2-port valve is closed for an extended period of time. The valve is then opened for 1 to 5 minutes (adjustable) at 2-hour intervals during off hours.

Avoid damage from moisture

In very warm and humid climates, the fan can be run periodically or continuously at a low fan speed (e.g. in empty apartments or shops) in Economy mode by setting parameter P61, in order to avoid damage from moisture due to lack of air circulation. See also section 3.8 “Fan control”, under “Fan kick function”.

Minimum output ON-time / OFF-time

Limit the ON/OFF switching cycle to protect the HVAC equipment, e.g. compressor and reduce wear and tear. The minimum output on-time and off-time for 2-position control output can be adjusted from 1 to 20 minutes via parameters P48 and P49. The factory setting is 1 minute.
Readjusting the setpoint or heating / cooling mode changeover immediately results in calculation of the output state; the outputs may not hold the minimum 1-minute ON/OFF time.
If parameter P48 or P49 is set to above 1 minute, the minimum ON/OFF time for the control output is maintained as set, even if the setpoint or changeover mode is readjusted.

Floor heating / Floor cooling

All heating sequences can also be used for floor heating.
You can use fan coil unit heating / cooling sequences for floor heating or cooling by disabling the fan via parameter P52.

Floor temperature limitation function

The floor temperature should be limited for 2 reasons: Comfort and protection of the floor.

The floor temperature sensor, connected to multifunctional input X1 or X2, acquires the floor temperature. If the temperature exceeds the parameterized limit (parameter P51), the heating valve is fully closed until the floor temperature drops to a level 2 K below the parameterized limit.
This function is factory-set to OFF (disabled).
Input X1 or X2 must be commissioned accordingly (P38 or P40 = 1).
See section 3.9 “Multifunctional input”.

Recommended values for P51:

Living rooms:
Up to 26 °C for long-time presence, up to 28 °C for short-time presence.
Bath rooms:
Up to 28 °C for long-time presence, up to 30 °C for short-time presence.

The table below shows the relation between parameter, temperature source and temperature display:

Parameter P51	External temp. sensor available	Source for display of room temperature	Output control according to	Floor temp. limit function
OFF	No	Built-in sensor	Built-in sensor	Not active
OFF	Yes	External temp. sensor	External temp. sensor	Not active
10...50 ˚C	No	Built-in sensor	Built-in sensor	Not active
10…50 ˚C	Yes	Built-in sensor	Built-in sensor + limit by external sensor	Active

The “Floor temperature limitation” function influences the outputs listed in the table below:

				“Floor temp. limit” function has impact on			
Application	**Output Y1**	**Output Y2**	**Output Y3**	**Heating (P01 = 0/2/3)**	**Cooling (P01 = 1/2/3)**	**Heat. and cool. (P01 = 4)**	**Remark**
2-pipe	H/C valve			Y1	N/A		
2-pipe & el heater	H/C valve	El heater		Y2	Y2 *)		Only el heater
2-pipe & radiator	H/C valve	Radiator		Y2	Y2		Only radiator
4-pipe	Heating valve	Cooling valve		Y1	N/A	Y1	
4-pipe & el heater	Heating valve	Cooling valve	El heater	Y3	N/A	Y3	Only el heater
2-stage	1st H/C	2nd H/C		Y1, Y2	N/A		

*) If P13 = ON → electric heater in cooling mode

Note Either floor temperature sensor or external room temperature sensor can be used.

Dew point monitoring

Dew point monitoring is essential to prevent condensation on the chilled ceiling (cooling with fan disabled, parameter P52). It helps avoid associated damage to the building.
A dew point sensor with a potential-free contact is connected to multifunctional input X1, X2 or D1. If there is condensation, the cooling valve is fully closed until no more condensation is detected, and the cooling output is disabled temporarily.

KNX

Fault state
Fault information

The condensation symbol “💧” is displayed during temporary override and the fault “Condensation in room” will be sent via bus.

The input must be commissioned accordingly (P38, P40, P42).

See section 3.9 “Multifunctional input”.

Button lock

If the “Button lock” function is enabled by parameter P14, the buttons will be locked or unlocked by pressing the right button for 3 seconds.
If “Auto lock” is configured, the thermostat will automatically lock the buttons 10 seconds after the last adjustment.

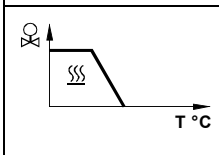
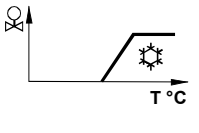
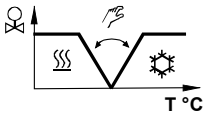
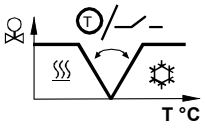
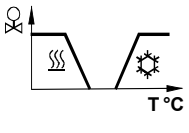
3.6 Control sequences

3.6.1 Sequences overview (setting via parameter P01)

The main control sequence (i.e. the water coil sequence of the fan coil unit) can be set via **parameter P01**.

The following sequences can be activated in the thermostats (each without or with auxiliary heating).

The available sequences depend on the application (selected via DIP switch, see section 3.4).

Parameter	**P01 = 0**	**P01 = 1**	**P01 = 2**	**P01 = 3**	**P01 = 4**
Sequence					
Available for basic application [1] : ↓	Heating	Cooling	Manually select heating or cooling sequence	Automatic heating / cooling changeover via external water temperature sensor or remote switch	Heating and cooling sequence, i.e. 4-pipe
2-pipe, 2-pipe & el heater 2-pipe & radiator	✓	✓	✓	✓	
4-pipe 4-pipe & el heater			✓ [2]	✓ [2]	✓
2-stage heating or cooling	✓	✓	✓	✓	

Notes: 1) For chilled / heated ceiling and radiator applications, see section 3.6.9;

2) For manual and automatic changeover with 4-pipe applications, see section 3.6.6:
   - 4-pipe **manual** changeover (P01 = 2) means activating either cooling or heating outputs
   - 4-pipe **automatic** changeover (P01 = 3) means swapping the control outputs according to a heating / cooling sensor or remote switch ("main and secondary" application), see section 3.6.6

For the relation between setpoints and sequences, see section 3.6.10.

3.6.2 Application mode

Application mode

The behavior of the thermostat can be influenced by a building automation and control system (BACS) via bus with the command “Application mode”.
With this signal, cooling and/or heating activity can be enabled or disabled.
Application mode is supported in LTE mode and S-mode.
The RDG KNX thermostats support the following commands:

#	Application mode	Description	Control sequence enabled
0	Auto	Thermostat automatically changes between heating and cooling	Heating and/or cooling
1	Heat	Thermostat is only allowed to heat	Heating only
2	Morning warm-up	If “Morning warm-up” is received, the room should be heated up as fast as possible (if necessary). The thermostat will only allow heating	Heating only
3	Cool	Thermostat is only allowed to provide cooling	Cooling only
4	Night purge	Not supported by fan coil applications	N/A (= Auto)
5	Pre-cool	If “Pre-cool” is received, the room should be cooled down as fast as possible (if necessary). The thermostat will only allow cooling	Cooling only
6	Off	Thermostat is not controlling the outputs, which means all outputs go to off or 0%	Neither heating nor cooling
8	Emergency heat	The thermostat should heat as much as possible. The thermostat will only allow heating	Heating only
9	Fan only	All control outputs are set to 0% and only the fan is set to high speed. Function will be terminated by any operation on the thermostat	Run fan in high speed

With all other commands, the thermostat behaves like in Auto mode, i.e. heating or cooling according to demand.

ACS Operating

The state (heating or cooling) of the thermostat can be monitored with the ACS700 tool (diagnostic value “Control sequence”). The last active mode is displayed when the thermostat is in the dead zone or temperature control is disabled.

Heating OR cooling

With a 2 pipe application, the control sequence state is determined by the application mode (see section 3.6.2) and by the state of the heating / cooling changeover signal (via local sensor or bus), or fixed according to the selected control sequence (P01 = heating (0) / cooling (1)).

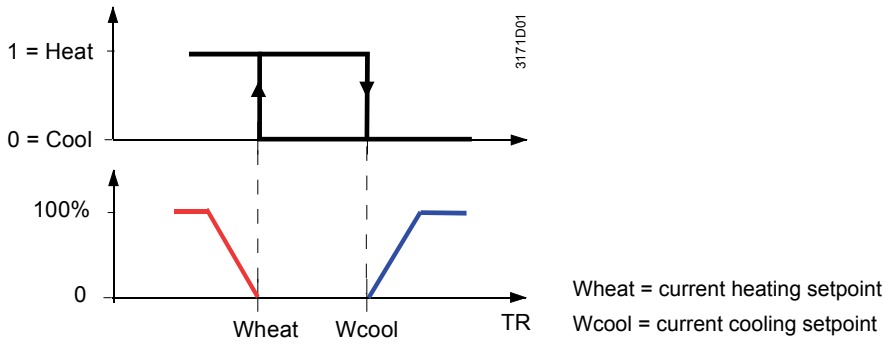
Application mode (via bus)	State changeover / continuous heating or cooling	Control sequence state
Auto (0)	Heating	Heating
	Cooling	Cooling
Heat (1), (2), (8)	Heating	Heating
	Cooling	**Heating**
Cool (3), (5)	Heating	**Cooling**
	Cooling	Cooling
Night purge (4), Fan only (9)	Heating	Heating
	Cooling	Cooling

Heating AND cooling

With a 4-pipe, 2-pipe with electric heater, and 2-pipe with radiator application, the control sequence state depends on the application mode and on the heating / cooling demand.

Application Mode (via bus)	Heating / cooling demand	Control sequence state
Auto (0)	Heating	Heating
	No demand	Heating / cooling depending on last active sequence
	Cooling	Cooling
Heat (1), (2), (8)	Heating	Heating
	No demand	**Heating**
	Cooling	**Heating**
Cool (3), (5)	Heating	**Cooling**
	No demand	**Cooling**
	Cooling	Cooling
Night purge (4), Fan only (9)	No temperature control active	Heating / cooling depending on last active sequence

The value of the output as a function of the room temperature is shown in the following diagram in case of a heating and cooling system:



3.6.3 2-pipe fan coil unit

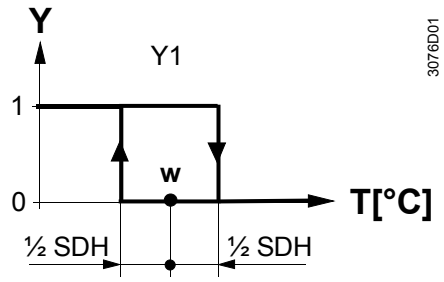
On 2-pipe applications, the thermostat controls a valve in heating / cooling mode with changeover (automatically or manually), heating only, or cooling only. Cooling only is factory-set (P01 = 1).

ON/OFF control

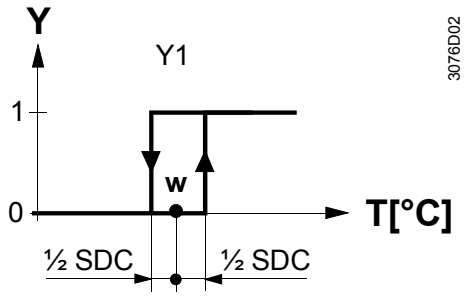
Control sequence ON/OFF output

The diagrams below show the control sequence for 2-position control.

Heating mode



Cooling mode



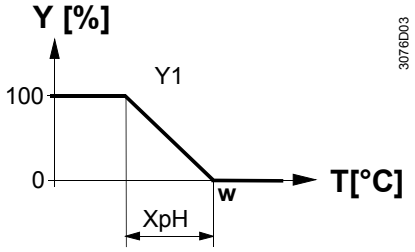
T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Valve”
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)

Modulating control: 3-position, PWM

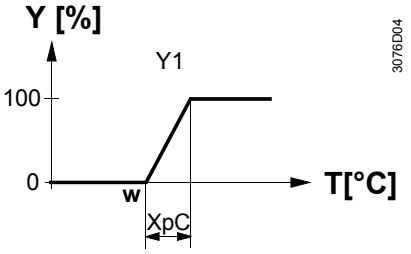
Control sequence modulating output

The diagrams below show the control sequence for modulating PI control.

Heating mode



Cooling mode



T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Valve”
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)

Note: The diagrams only show the PI thermostat’s proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.4 2-pipe fan coil unit with electric heater

Heating or cooling with auxiliary heater

On 2-pipe applications with electric heater, the thermostat controls a valve in heating / cooling mode with changeover, heating only, or cooling only plus an auxiliary electric heater.
Cooling only is factory-set (P01 = 1) with enabled electric heater (P13).

Electric heating, active in cooling mode

In cooling mode, the valve receives an **OPEN** command if the acquired temperature is above the setpoint.
The electric heater receives an **ON** command if the acquired room temperature drops below “setpoint” minus “dead zone” (= setpoint for electric heater) while the electric heater is enabled (parameter P13 = ON).

Note: “Setpoint for electric heater” is limited by parameter “Maximum setpoint for Comfort mode” (P10).

Electric heating in heating mode

In heating mode, the valve receives an **OPEN** command if the acquired temperature is below the setpoint. The electric heater is used as an additional heating source when the heating energy controlled by the valve is insufficient.
The electric heater receives an **ON** command, if the temperature is below “setpoint” minus “setpoint differential” (= setpoint for electric heater).

Electric heating and manual changeover

The electric heater is active in heating mode only and the control output for the valve is permanently disabled when manual changeover is selected (P01 = 2).

Digital input “Enable electric heater”

Remote enabling / disabling of the electric heater is possible via input X1, X2 or D1 for tariff regulations, energy savings, etc.
Input X1, X2, or D1 must be commissioned accordingly (parameters P38, P40, P42). See section 3.9 “Multifunctional input”.

KNX

Enable electric heater

The electric heater can also be enabled / disabled via bus.

Note: If “Enable electric heater” input is used via bus, then the function **must not** be assigned to a local input X1, X2 or D1.

Caution ⚠ An electric heater must always be protected by a safety limit thermostat!

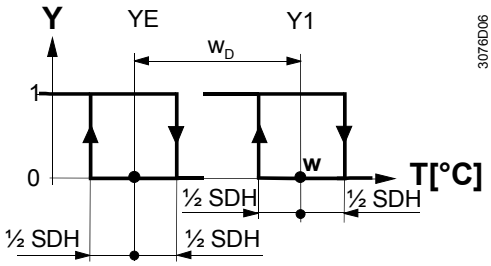
ON/OFF control

Control sequence ON/OFF output

The diagrams below show the control sequence for 2-position.

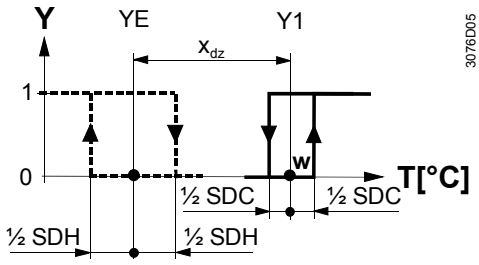
Heating mode

(automatic changeover = heating or heating only)

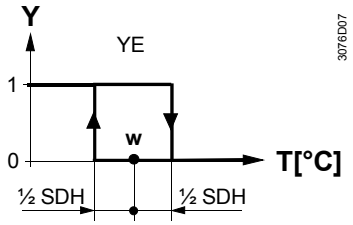


Cooling mode

(man. / auto. changeover = cooling or cooling only)



Heating mode with manual changeover (P01 = 2) *(manual changeover = heating)*



T[°C]	Room temperature
W	Room temperature setpoint
Y1	Control command “Valve”
YE	Control command “Electric heater”
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

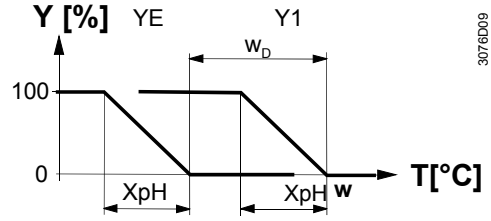
Modulating control: 3-position, or PWM

Control sequence modulating output

The diagrams below show the control sequence for modulating control.

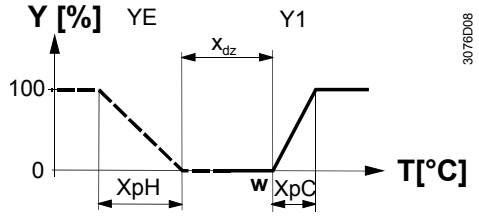
Heating mode

(automatic changeover = heating or heating only)



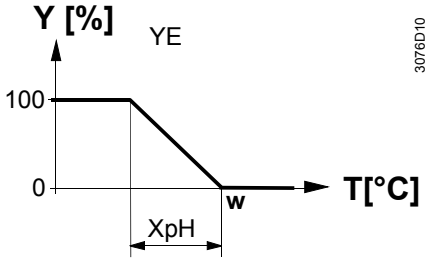
Cooling mode

(man. /auto. changeover = cooling or cooling only)



Heating mode with manual changeover (P01 = 2)

(manual changeover = heating)



T[°C]	Room temperature
W	Room temperature setpoint
Y1	Control command “Valve”
YE	Control command “Electric heater”
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note: The diagrams only show the PI thermostat’s proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.5 2-pipe fan coil unit with radiator or floor heating

Heating or cooling with radiator or floor heating

On 2-pipe applications with radiator, the thermostat controls a valve in heating / cooling mode with changeover, heating only, or cooling only plus a radiator valve. Cooling only is factory-set (P01 = 1).

Radiator, active in cooling mode

In cooling mode, the valve receives an **OPEN** command if the acquired temperature is above the setpoint.
The radiator receives an **ON** command if the acquired room temperature drops below “setpoint” minus “dead zone” (= setpoint for radiator).

Radiator in heating mode

In heating mode, the radiator receives an **OPEN** command if the acquired temperature is below the setpoint. The fan coil unit is used as an additional heat source when the heat energy controlled by the radiator is insufficient.
The fan coil unit receives an **ON** command if the temperature is below “setpoint” minus “setpoint differential” (= setpoint for fan coil unit).

Floor heating

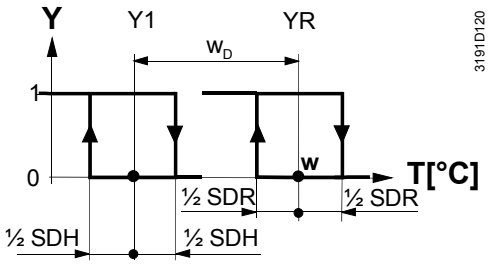
The radiator sequence can also be used for floor heating.
The "Floor heating limitation” function is described on page 26.

ON/OFF control

The diagrams below show the control sequence for 2-position control.

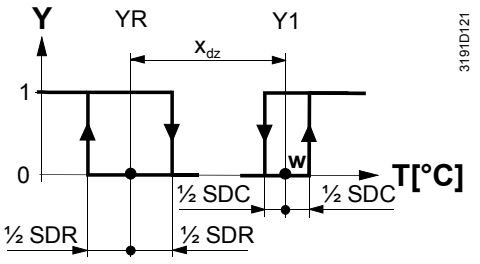
Heating mode

(automatic changeover = heating or heating only)



Cooling mode

(man. /auto. changeover = cooling or cooling only)



T[°C] Room temperature
W Room temperature setpoint
Y1 Control command “Valve” or “Compressor”
YR Control command “Radiator”

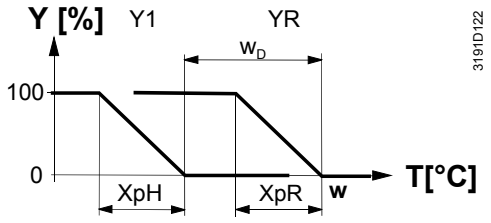
SDH Switching differential “Heating” (P30)
SDC Switching differential “Cooling” (P31)
SDR Switching differential “Radiator” (P32)
X_{dz} Dead zone (P33)
w_D Setpoint differential (P34)

Modulating control: 3-position or PWM

The diagrams below show the control sequence for modulating PI control.

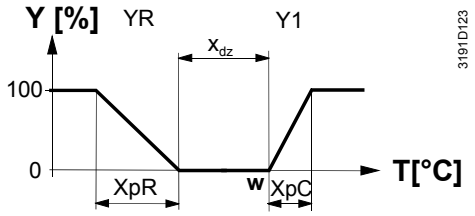
Heating mode

(automatic changeover = heating or heating only)



Cooling mode

(man. / auto. changeover = cooling or cooling only)



T[°C]	Room temperature
W	Room temperature setpoint
Y1	Control command “Valve”
YR	Control command “Radiator”

XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
XpR	Proportional band “Radiator” (P32)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note: The diagrams only show the PI thermostat’s proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.6 4-pipe fan coil unit

Heating and cooling

On 4-pipe applications, the thermostat controls 2 valves in heating and cooling mode, heating / cooling mode by manual selection, or heating and cooling mode with changeover. Heating and cooling mode (P01 = 4) is factory-set.

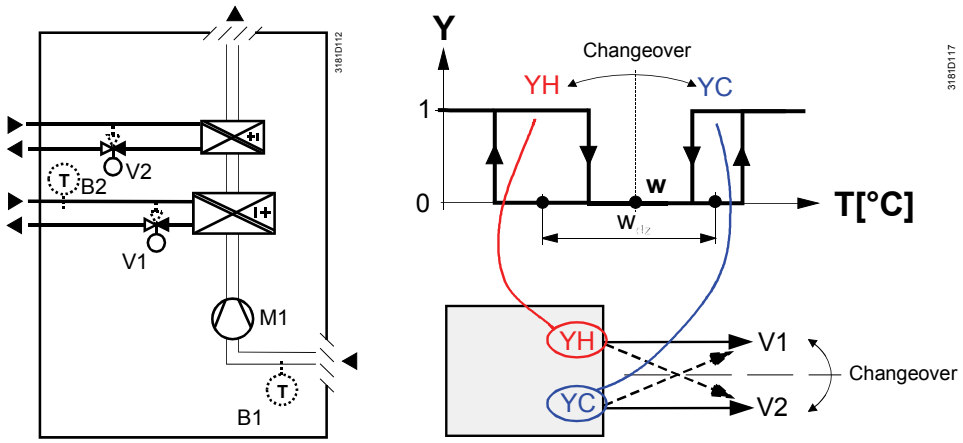
4-pipe application with manual changeover

The heating or cooling output can be released via operating mode button if parameter P01 is set to Manual (P01 = 2).

"Main and secondary" application (4-pipe with changeover)

If parameter P01 is set to changeover (P01 = 3), the heating and cooling output is swapped according to the input state of the changeover sensor / switch / bus input (see automatic heating and cooling changeover sensor in section 3.5). This mode is used for the so-called “Main and secondary” application. This is a 4-pipe fan coil unit system with different capacities of the 2 coils. The water circuit is changed to optimize the energy exchange depending on the season (summer / winter):

– Winter: Large coil (V1) for heating, small coil (V2) for cooling
– Summer: Large coil (V1) for cooling, small coil (V2) for heating



Note:
This example shows ON/OFF control; for modulating control, connect the appropriate output terminals

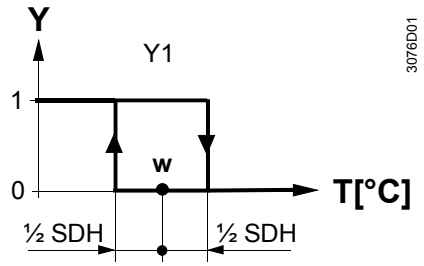
Notes:

- The parameter for the heating and cooling changeover sensor (B2 in the above diagram) must be set to 2 (X1 or X2, P38 or P40)
- The thermostat assumes winter operation when B2 > P37 (factory setting 28 °C)
- The thermostat assumes summer operation when B2 < P36 (factory setting 16 °C)

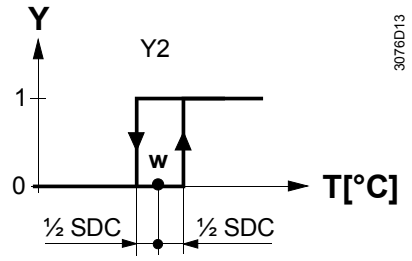
ON/OFF control

The diagrams below show the control sequence for 2-position control.

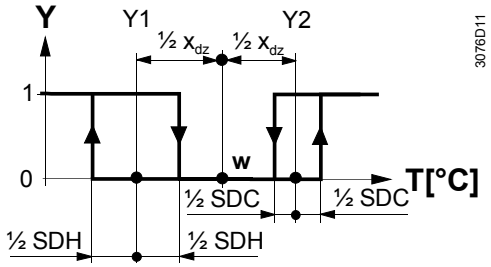
Heating mode with manual selection (P01 = 2)



Cooling mode with manual selection (P01 = 2)



Heating and cooling mode (P01 = 04)

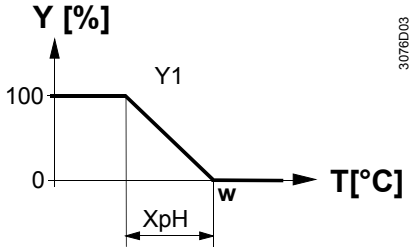


T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Valve” (H)
Y2	Control command “Valve” (C)
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)

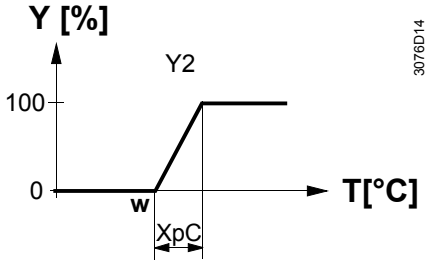
Modulating control: 3-position, PWM or DC 0…10 V

The diagrams below show the control sequence of modulating PI control.

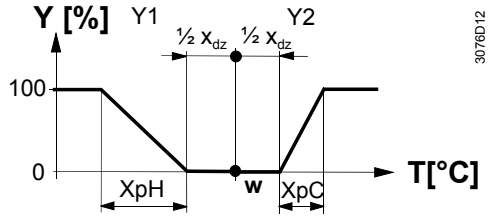
Heating mode with manual selection (P01 = 2)



Cooling mode with manual selection (P01 = 2)



Heating and cooling mode (P01 = 04)



T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Valve” heating
Y2	Control command “Valve” cooling
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
X_{dz}	Dead zone (P33)

Note: The diagrams only show the PI thermostat’s proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.7 4-pipe fan coil unit with electric heater

Heating and cooling with auxiliary heater

On 4-pipe applications with electric heater, the thermostat controls 2 valves in heating and cooling mode by manual selection, heating and cooling mode with automatic changeover, heating only, or cooling only plus an auxiliary electric heater. Heating and cooling is factory-set (P01 = 4).

Electric heating in heating mode

The electric heater is used as an additional heat source when the heating energy controlled by the valve is insufficient.
The electric heater receives an **ON** command when the temperature is below “setpoint” minus “1/2 "dead zone" minus "setpoint differential" (= setpoint for electric heater).

Digital input “Enable electric heater”

Remote enabling / disabling of the electric heater is possible via input X1, X2, or D1 for tariff regulations, energy saving, etc.
Input X1, X2, or D1 must be commissioned accordingly (parameters P38, P40, P42). See section 3.9 “Multifunctional input”.

KNX

Enable electric heater

The electric heater can also be enabled / disabled via bus.

If the bus input is used, then the function must NOT be assigned to a local input X1, X2 or D1.

Caution ⚠ An electric heater must always be protected by a safety limit thermostat!

4-pipe application with manual changeover

The heating or cooling output can be released via operating mode button if parameter P01 is set to Manual (P01 = 2).

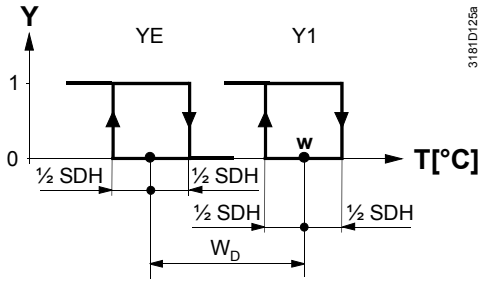
“Main and secondary” application

See section 3.6.6.

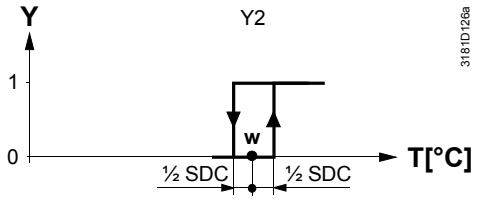
ON/OFF control

The diagrams below show the control sequence for 2-position control.

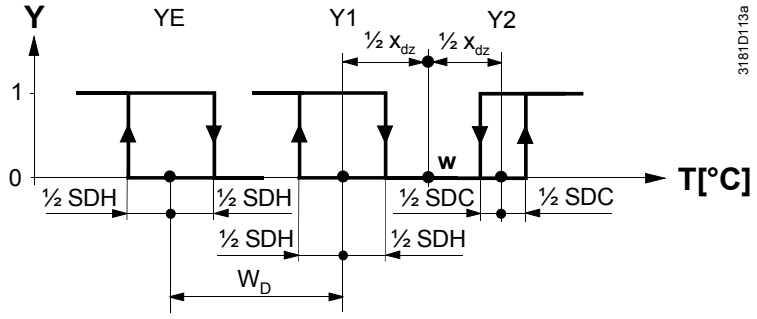
Heating mode with **manual** selection (P01 = 2)



Cooling mode with **manual** selection P01 = 2)



Heating and cooling mode (P01 = 4)

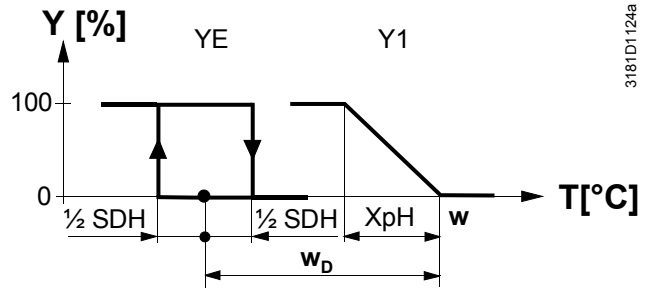


T[°C]	Room temperature
w	Room temperature setpoint
YE	Control command “El heater"
Y1	Control command “Valve” (H)
Y2	Control command “Valve” (C)
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

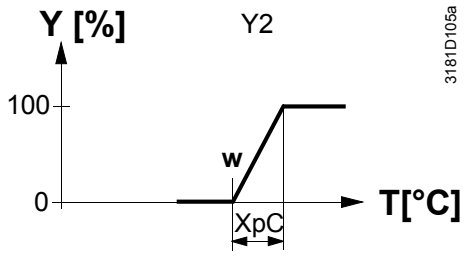
Modulating control: 3-position or PWM

The diagrams below show the control sequence of modulating PI control.

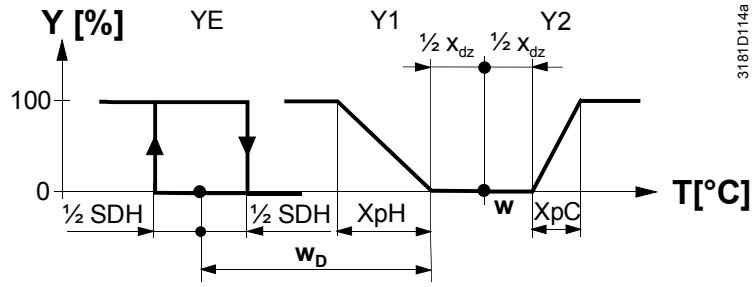
Heating mode with manual selection (P01 = 2)



Cooling mode with manual selection P01 = 2)



Heating and cooling mode (P01 = 4)



T[°C]	Room temperature
w	Room temperature setpoint
YE	Control command “El heater" (only ON/OFF)
Y1	Control command “Valve” (H) (only PWM, not 3-position)
Y2	Control command “Valve” (C)
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note: The diagrams only show the PI thermostat’s proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

Notes:
- Y1 can only be ON/OFF or PWM
- Y2 can be ON/OFF, PWM or 3-position
- YE can only be ON/OFF

3.6.8 2-stage heating or cooling

2-stage heating or cooling

On 2-stage applications, the thermostat controls 2 valves or compressors in heating or cooling mode or changeover (automatically or manually).
“Cooling only" is factory-set (P01 = 1).

Heating mode

In heating mode, the 1st stage is activated if the acquired temperature is below the setpoint.
The 2nd stage is activated if the acquired room temperature drops below “setpoint” minus “setpoint differential”.

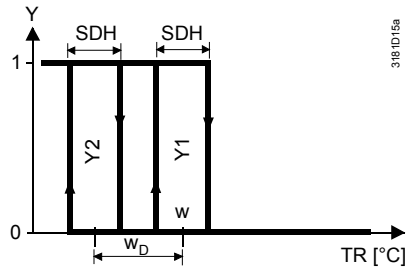
Cooling mode

In cooling mode, the 1st stage is activated if the acquired temperature is above the setpoint.
The 2nd stage is activated if the acquired room temperature rises above “setpoint” plus “setpoint differential”.

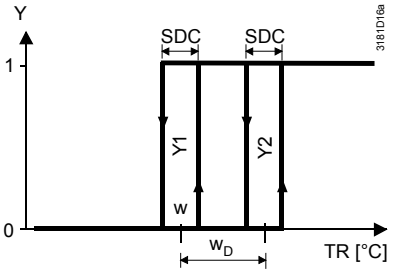
ON/OFF control

The diagrams below show the control sequence for 2-position control.

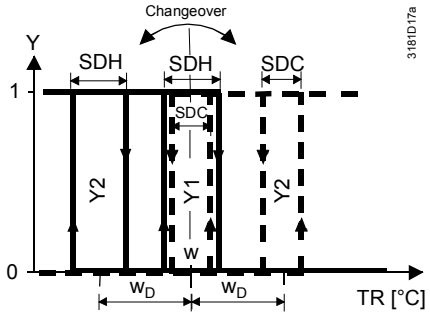
Heating mode (P01 = 0)



Cooling mode P01 = 1)



Changeover (P01 = 2 or P01 = 3)

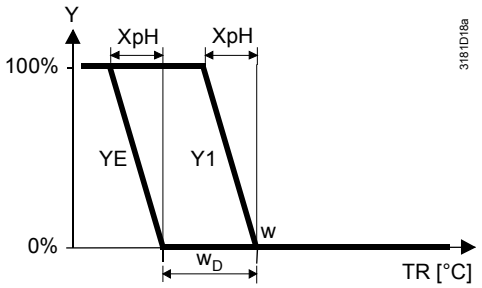


T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Stage 1"
Y2	Control command “Stage 2”
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

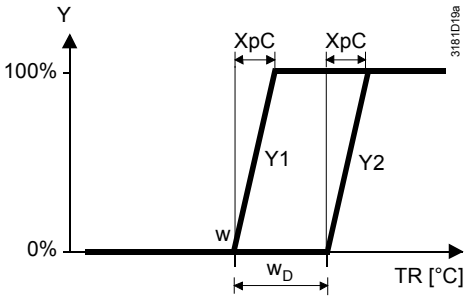
Modulating control: 3-position or PWM

The diagrams below show the control sequence of modulating PI control.

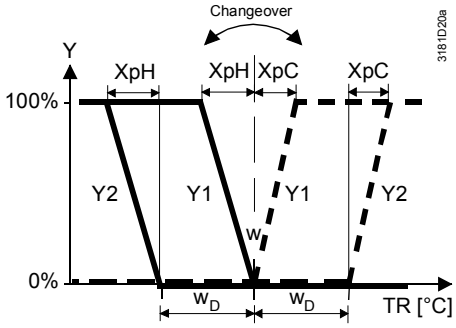
Heating mode (P01 = 0)



Cooling mode P01 = 1)



Changeover (P01 = 2 or P01 = 3)



T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Stage 1"
Y2	Control command “Stage 2”
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note: The diagrams only show the PI thermostat’s proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.9 Chilled / heated ceiling and radiator applications

For chilled / heated ceiling and radiator,

- set the corresponding basic application
- disable the fan (P52)

The following applications are available:

Application for chilled / heated ceiling, radiator	Set basic application	See section	Sequences
Chilled / heated ceiling with changeover	2-pipe	3.6.3	H (\ ) C (/)
Chilled / heated ceiling & el heater (cooling only: disable el heater via P13)	2-pipe and electric heater	3.6.4	El H + H (≠\ \ ) El H + C (≠\ /) C (/)
Chilled / heated ceiling and radiator	2-pipe and radiator	3.6.5	H + rad (\ r\ ) Rad + C (r\ /)
Chilled ceiling and radiator	4-pipe	3.6.6	H + C (\ /)
Cooling or heating 2-stage	2-stage heating or cooling	3.6.8	H + H (\ \ ) C + C (/ /)

3.6.10 Setpoints and sequences

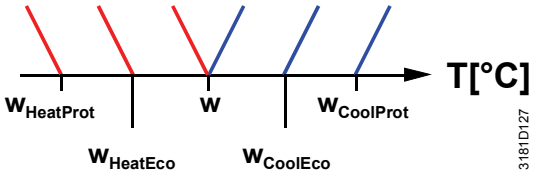
2-pipe and 2-stage applications

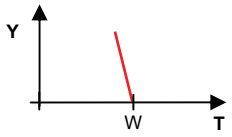
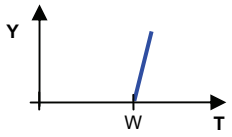
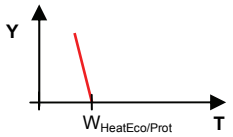
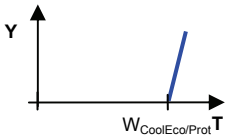
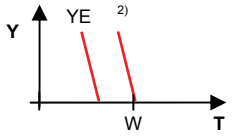
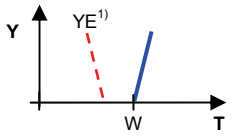
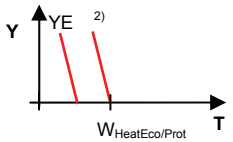
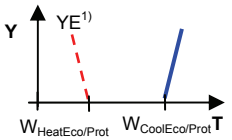
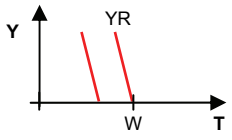
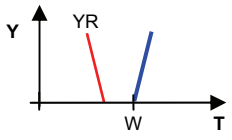
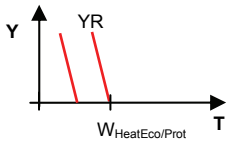
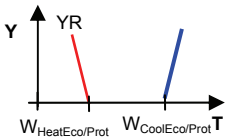
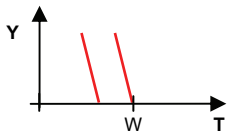
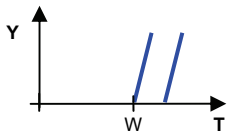
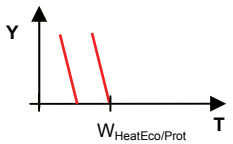
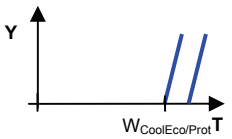
On changeover applications, the Comfort setpoints for heating and cooling sequence are the same (w).

On 2-pipe applications with electric heater, the Comfort setpoint is either at the first heating sequence (in heating mode) or at the cooling sequence (in cooling mode).

On 2-pipe applications with radiator, the Comfort setpoint is either at the radiator sequence (in heating mode) or at the cooling sequence (in cooling mode).

The setpoints for Economy and Protection mode are below the Comfort setpoints (heating) and above the Comfort setpoints (cooling).
They can be set via parameters P11, P12 (Economy mode) and P65, P66 (Protection mode).



Application	Comfort mode		Economy / Protection mode	
	Heating	Cooling	Heating	Cooling
2-pipe				
2-pipe and electric heater				
2-pipe and radiator				
2-stage heating or cooling				

1) If P13 = ON

2) In case of manual changeover (P01 = 2), the first heating sequence is disabled to prevent heating (electric heater) and cooling (coil) at he same time

W = setpoint in Comfort mode

$W_{HeatEco/Prot}$ = setpoint heating in Economy or Protection mode

$W_{CoolEco/Prot}$ = setpoint cooling in Economy or Protection mode

YR = radiator sequence

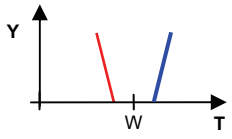
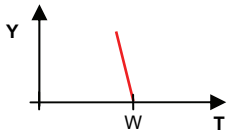
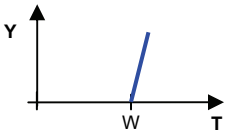
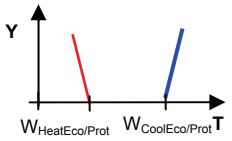
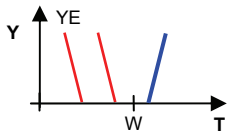
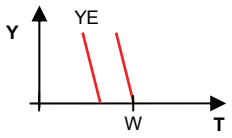
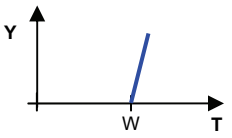
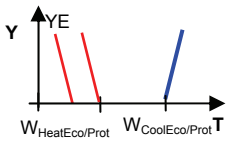
YE = electric heater sequence

4-pipe applications

On 4-pipe applications, the Comfort setpoint (w) is in the middle of the dead zone, between the heating and cooling sequence.

The dead zone can be adjusted via parameter P33.

If manual changeover is selected, then either the cooling sequence or the heating sequence is released. In this case, the Comfort setpoint is at the selected heating or cooling sequence.

Application	Comfort mode			Economy / Protection mode
	Heating and cooling	Heating only [1]	Cooling only [1]	Heating and/or cooling
4-pipe				
4-pipe and electric heater				

1) Manual changeover, P01 = 2

W = setpoint in Comfort mode

$W_{HeatEco/Prot}$ = heating setpoint for Economy or Protection mode

$W_{CoolEco/Prot}$ = cooling setpoint for Economy or Protection mode

YE = electric heater sequence

3.7 Control outputs

3.7.1 Overview

Overview of control outputs

Different control output signals are available. They need to be defined during commissioning (see below).

Control output / Product no.	2-position	2-position PWM	3-position	DC 0…10 V
RDG100KN	Y1, Y2, Y3 (3 x NO)	Y1, Y3, (2 x PWM)	Y1/Y2, Y3/Y4 (2 x ▲ / ▼)	---

ON/OFF control signal
(2-position)

The valve receives the **OPEN/ON** command via control output Y1 or Y3 when…

1. the acquired room temperature is below the setpoint (heating mode) or above the setpoint (cooling mode).
2. the control outputs have been inactive for more than the “Minimum output OFF-time” (factory setting 1 minute, adjustable via parameter P48).

OFF command when…

1. the acquired room temperature is above the setpoint (heating mode) or below the setpoint (cooling mode).
2. the valve has been active for more than the “Minimum output on-time” (factory setting 1 minute, adjustable via parameter P49).

Electric heater control signal
(2-position)

The electric heater receives an **ON** command via the auxiliary heating control output (Y…, see Mounting Instructions) when…

1. the acquired room temperature is below the “Setpoint for electric heater”
2. the electric heater has been switched off for at least 1 minute

The **OFF** command for the electric heater is output when…

1. the acquired room temperature is above the setpoint (electric heater)
2. the electric heater has been switched on for at least 1 minute

Caution ⚠ A safety limit thermostat (to prevent overtemperatures) must be provided externally.

3-position control signal

Heating: Output Y1 provides the **OPEN** command, and Y2 the **CLOSE** command to the 3-position actuator. Cooling: Same with Y3 and Y4.
The factory setting for the actuator's running time is 150 seconds. It can be adjusted via parameters P44 (Y1 and Y2) or P45 (Y3 and Y4).
The parameters are only visible if 3-position is selected via DIP switches 4 and 5.

Synchronization

1. When the thermostat is powered up, a closing command for the actuator running time + 150% is provided to ensure that the actuator fully closes and synchronizes to the control algorithm.
2. When the thermostat calculates the positions "fully close" or "fully open", the actuator's running time is extended + 150% to ensure the right actuator position is synchronized to the control algorithm.
3. After the actuator reaches the position calculated by the thermostat, a waiting time of 30 seconds is applied to stabilize the outputs.

PWM control

The demand calculated by PI control from the current room temperature and set-point is provided via Y1 and Y3 to the valve actuator as a PWM (pulse width modulation) signal for thermal actuators. The output is activated for a period proportional to the heating / cooling demand and then switched off for the rest of the PWM interval.

The interval is 150 seconds (factory setting). It can be adjusted via parameters P44 (Y1) or P45 (Y3). These parameters are only visible if 2-position is selected via DIP switches 4 and 5 and if PWM is selected via P46 and P47.

PWM for thermal valve actuators

For thermal valve actuators, set the running time to 240 seconds.

Note!

- Never apply PWM to a motorized actuator
- It is not possible to ensure exact parallel running of 2 or more thermal valve actuators. If several fan coil systems are controlled by the same room thermostat, preference should be given to motorized actuators

PWM for electric heaters

For electric heaters, set the running time to 90 seconds.
To avoid burn-off of mechanical contacts by frequent switching, use a current valve in place of a relay or contactor.

3.7.2 Control outputs configuration (setting via DIP switches 4/5 or tool, and parameters P46/P47)

The type of the control outputs (2- or 3-position) is set via DIP switches 4 and 5.

The patterns of DIP switches 4 and 5 are as follows:

Y1/Y2 =	2-position	2-position	3-position	3-position
Y3/Y4 =	2-position	3-position	2-position	3-position

Notes:

- If 2-position is selected, the factory setting is ON/OFF. If you want PWM (pulse width modulation), set parameters P46 and/or P47 to 2 = PWM
- 4-pipe with electric heater: As the electric heater requires 1 of 4 outputs, only the cooling valve actuator can be 3-position
- DIP switches 4 and 5 have no impact if the application is commissioned via tool. Control outputs need to be set via ACS in this case

For details concerning connection of peripheral devices and setting of the DIP switches, refer to the Mounting Instructions M3191 [3].

3.8 Fan control

The fan operates in automatic mode or at the selected speed with manual mode. In automatic mode, the fan speed depends on the setpoint and the current room temperature. When the room temperature reaches the setpoint, the control valve closes and the fan switches off or stays at fan speed 1 (parameter P60; factory setting: 0 = fan speed 1 in dead zone).

KNX

Fan command value
Enable fan command value

The fan speed and mode can be changed via bus.

For this purpose, the fan command value needs to be enabled.

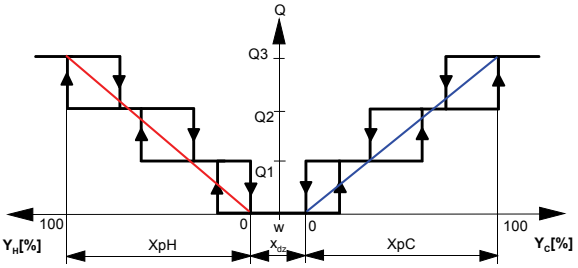
KNX

Fan operation
Fan stage 1-2-3
Fan output

The fan speed and mode can be monitored via bus.

3-speed fan control with modulating heating / cooling control

The individual switching points for **ON** of each fan stage can be adjusted via control parameters P55…P57. The fan speed switch off point is 20% below the switch on point. The diagrams below show fan speed control for modulating PI control.



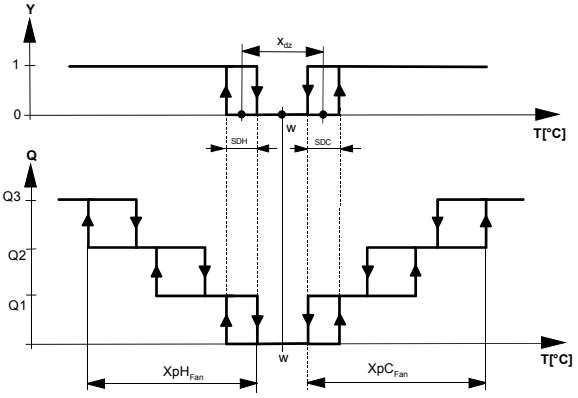
w	Room temperature setpoint
Q	Fan speed
Y_H	Control demand “Heating”
Y_C	Control demand “Cooling”
XpH	Proportional band “Heating”
XpC	Proportional band “Cooling”
X_{dz}	Dead zone

Note: The diagram only shows the PI thermostat’s proportional part.

3-speed fan control with ON/OFF heating / cooling control

On applications with 2-position control:

1) The switching point for low fan speed (Q1) is synchronized to the heating / cooling output. Parameter “Switching point fan speed low” P57 is not relevant.
2) The maximum switching range of the fan (XpH_{Fan} / XpC_{Fan}) is defined by the switching differential (SDH/SDC) via a look-up table.



T[°C]	Room temperature
w	Room temperature setpoint
Q	Fan speed
Y	Control command “Valve”
SDH	Switching differential “Heating”
SDC	Switching differential “Cooling”
X_{dz}	Dead zone
XpH_{Fan}	Switching range for fan “Heating”
XpC_{Fan}	Switching range for fan “Cooling”

Look-up table with ON/OFF control

SDH/SDC [K]	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	>4.5
XpH_{Fan}/XpC_{Fan} [K]	2	3	4	5	6	7	8	9	10

1-speed / 3-speed fan

The thermostat can control a 1- or 3-speed fan (selected via control parameter P53). A 1-speed fan is connected to terminal Q1, a 3-speed fan to terminals Q1, Q2 and Q3.

Fan operation as per heating / cooling mode, or disabled

Fan operation can be limited to be active with cooling only or heating only, or even be totally disabled via control parameter “Fan operation” P52.
When fan operation is disabled, the fan symbol on the display disappears and pressing the fan button has no impact.
This function allows you to use the thermostat on universal applications such as chilled / heated ceilings and radiator, etc. (see section 3.6.9).

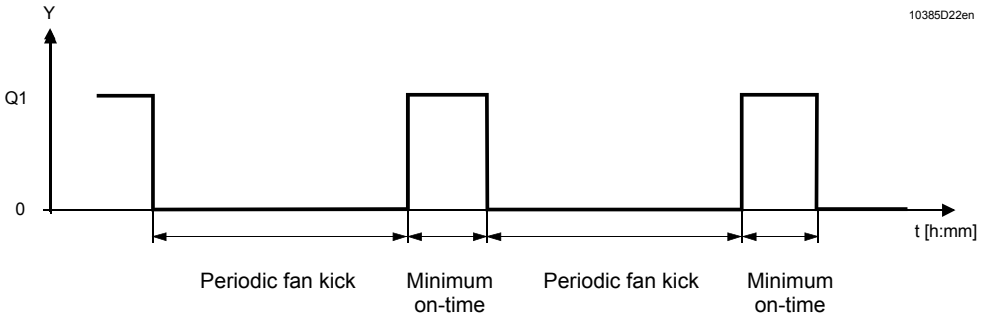
Fan minimum on- time

In automatic mode, a dwelling time of 2 minutes (factory setting) is active. The fan maintains each speed for at least 2 minutes before it changes to the next speed. his minimum on-time can be adjusted from 1…6 minutes via parameter P59.

Fan operation in dead zone (fan kick)

In automatic fan mode and with the room temperature in the dead zone, the control valve is normally closed and the fan disabled. With the “Fan kick” function, the fan can be released from time to time at low speed for minimum on-time (see above) even if the valve is closed.

This function can be used to avoid damage from moisture due to a lack of air circulation, or to allow a return air temperature sensor to acquire the correct room temperature.

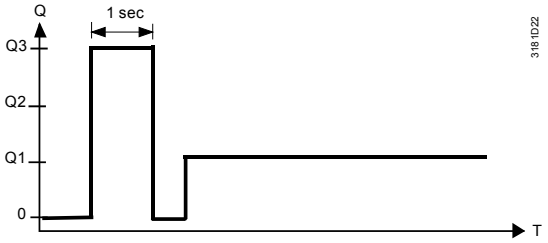


The periodic fan kick time can be selected individually for Comfort mode via parameter P60, and for Economy mode via parameter P61.

Note: Fan kick value “0” means the fan runs continuously in the dead zone.
Fan kick value “OFF” means the fan does not run in the dead zone.

Fan start

When the fan starts from standstill, it starts at speed 3 for 1 second to ensure safe fan motor start by overcoming inertia and friction (selected via parameter P58).



Fan overrun for electric heater

When the electric heater is switched off, the fan overruns for 60 seconds (parameter P54) to avoid overtemperature of the electric heater or prevent the thermal cutout from responding.

⚠ Fan failure

In case of fan failure, the thermostat cannot protect the electric heater against overtemperature. For this reason, the electric heater must feature a separate safety device (thermal cutout).

Clean fan filter reminder

The “Clean fan filter reminder” function counts the fan operating hours and displays message “FIL 🔔“ to remind the user to clean the fan filter as soon as the threshold is reached. This does not impact the thermostat's operation, which continues to run normally.

KNX

Fault information

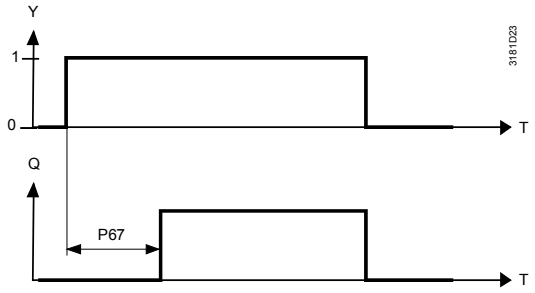
The “Clean filter reminder” is reset when the operating mode is manually set to Protection and back.

Fan in Auto Timer mode

In Auto Timer mode Auto, the default fan mode is automatic. The fan mode can be changed to Manual by pressing the FAN button. The fan returns to the automatic default mode after each switchover from Comfort to Economy mode, and vice versa.

Fan start delay (2-position control only)

To let the heating / cooling coil reach its temperature, the fan start can be delayed by a time period set via parameter P67.



3.9 Multifunctional input, digital input

The thermostat has 2 multifunctional inputs X1 and X2 and a digital input D1. An NTC type sensor like the QAH11.1 (AI, analog input) or a switch (DI, digital input) can be connected to the input terminals. The functionality of the inputs can be configured via parameters P38 + P39 for X1, P40 + P41 for X2, and P42 + P43 for D1.

The current temperature or state of the inputs X1/X2 and D1 is available on bus for monitoring purposes.

The parameters can be set to the following values:

#	Function of input	Description	Type X1/X2	Type DI
0	Not used	No function.	--	--
1	External / return air temperature	Sensor input for external room temperature sensor or return air temperature sensor to acquire the current room temperature, or floor heating temperature sensor to limit the heating output. *Note:* The room temperature is acquired by the built-in sensor if the floor temperature limitation function is enabled via parameter P51.	AI	--
2	Heating / cooling changeover	Sensor input for "Automatic heating / cooling changeover" function. A switch can also be connected rather than a sensor (switch closed = cooling, see section 3.5). Heating / cooling changeover is also possible via bus. In this case, the function must not be assigned to any local input X1, X2, D1. See also section 3.5. Diagnostic value 0 ˚C is displayed for closed contact / 100 ˚C for open contact, if a switch is connected.	AI / DI	DI
3	Operating mode switchover	Digital input to switch over the operating mode to Economy. If the operating mode switchover contact is active, user operations are ineffective and "OFF" is displayed. Operating mode switchover is also possible via bus. In this case, the function must not be assigned to any local input X1, X2, D1. See also section 3.2.	DI	DI
4	Dew point monitor	Digital input for a dew point sensor to detect condensation. Cooling is stopped if condensation occurs.	DI	DI
5	Enable electric heater	Digital input to enable / disable the electric heater via remote control. Enable electric heater is also possible via bus. In this case, the function must not be assigned to any local input X1, X2, D1. See also section 3.6.	DI	DI

Heating/ cooling changeover

Window state

Enable electric heater

#	Function of input	Description	Type X1/X2	Type DI
6	Fault	Digital input to signal an external fault (example: dirty air filter). If the input is active, “ALx” is displayed and a fault is sent on the bus. See also section 3.11.8. (Alarm x, with x = 1 for X1, x = 2 for X2, x = 3 for D1). *Note*: Fault displays have no impact on the thermostat's operation. They merely represent a visual signal.	DI	DI
7	Monitor input (Digital)	Digital input to monitor the state of an external switch via bus.	DI	DI
8	Monitor input (Temperature)	Sensor input to monitor the state of an external sensor (e.g. QAH11.1) via bus.	AI	--

Fault information

D1, X1, X2 (Digital)

X1, X2 (Temp.)

- Operational action can be changed between normally open (NO) and normally closed (NC) via parameter P39, P41 (or P43 if it is a digital input)
- Each input X1, X2 or D1 must be configured with a different function (1…5). Exception: 1, 2 or 3 inputs can be configured as fault (6) or monitor input (7,8)
- X1 is factory-set to “External sensor” (1), X2 to “Not used” (0), and D1 to “Operating mode switchover” (3)

For more detailed information, refer to section 3.4 “Applications”.

3.10 Handling faults

Temperature out of range

When the room temperature is outside the measuring range, i.e. above 49 °C or below 0 °C, the limiting temperatures blink, e.g. “0 °C” or “49 °C”.
In addition, the heating output is activated if the current setpoint is not set to “OFF”, the thermostat is in heating mode and the temperature is below 0 °C.
For all other cases, no output is activated.

The thermostat resumes Comfort mode after the temperature returns to within the measuring range.

For fault status messages on the bus, see section 3.11.8.

3.11 KNX communications

The RDG KNX thermostats support communications as per the KNX specification.

S-mode Standard mode; engineering via group addresses.

LTE mode Logical Tag Extended mode, for easy engineering, is used in conjunction with Synco.

3.11.1 S-mode

This mode corresponds to KNX communications.
Connections are established via ETS3 Professional by assigning communication objects to group addresses.

3.11.2 LTE mode

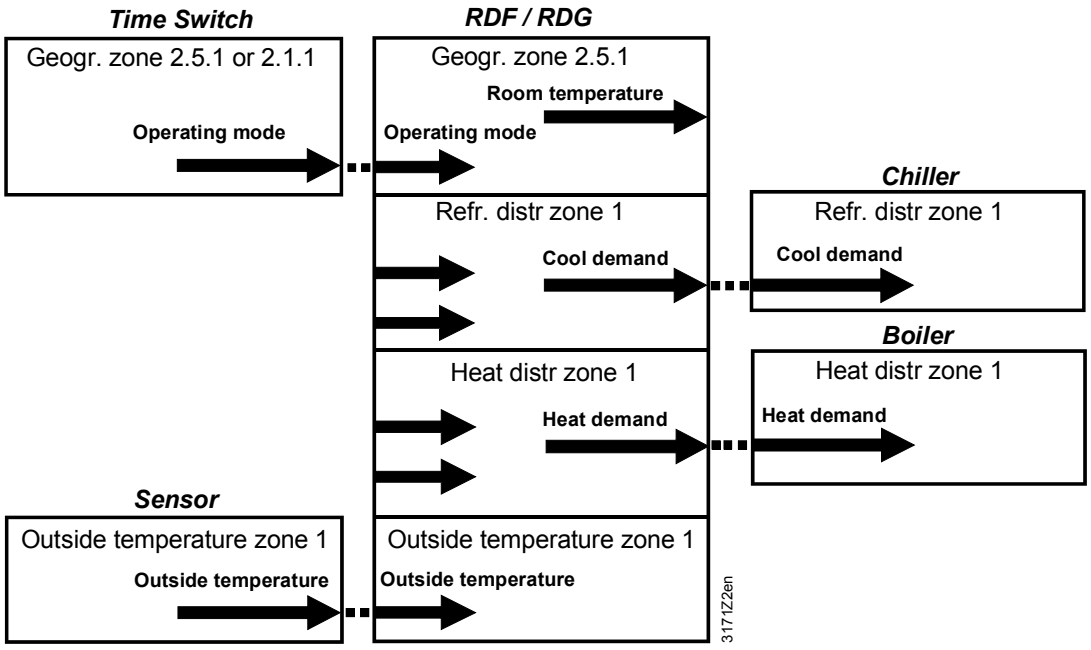
LTE mode was specifically designed to simplify engineering. Unlike with S-mode, there is no need to create the individual connections (group addresses) in the tool. The devices autonomously establish connections.

Definitions

To make this possible, the following circumstances are predefined:

- Every device or subdevice is located within a zone
- Every data point (input or output) is assigned to a zone
- Every data point (input or output) has a precisely defined "name"

Whenever an output and an input with the same "name" are located in the same zone, a connection is established automatically, as shown in the following diagram.



Engineering and commissioning

- For a detailed description of KNX (topology, bus supply, function and setting of LTE zones, filter tables, etc.), see "Communication via the KNX bus for Synco 700, 900 and RXB/RXL, Basic Documentation" [6]
- LTE mode data points and settings are described in the Synco Application Manual [12]
- To engineer and commission a specific system, use the Synco700 planning and commissioning protocol (XLS table in HIT, [7])

3.11.3 Zone addressing in LTE mode (in conjunction with Synco)

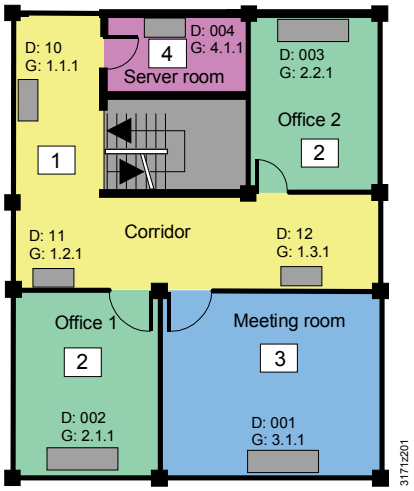
In cases where RDG KNX room thermostats are used in LTE mode (e.g. in conjunction with Synco), zone addresses need to be allocated.
The following zone address must be defined together with the Synco devices at the planning stage depending on the application.

Short description	Factory setting	Parameter
Geographical zone (apartment)	--- (out of service)	P82
Geographical zone (room)	1	P83
Heat distr zone heating coil	1	P84
Refr distr zone cooling coil	1	P85
Heat distr zone heating surface	2	P86

Note: “Subzone” of “Geographical zone” is fix 1 (not adjustable)

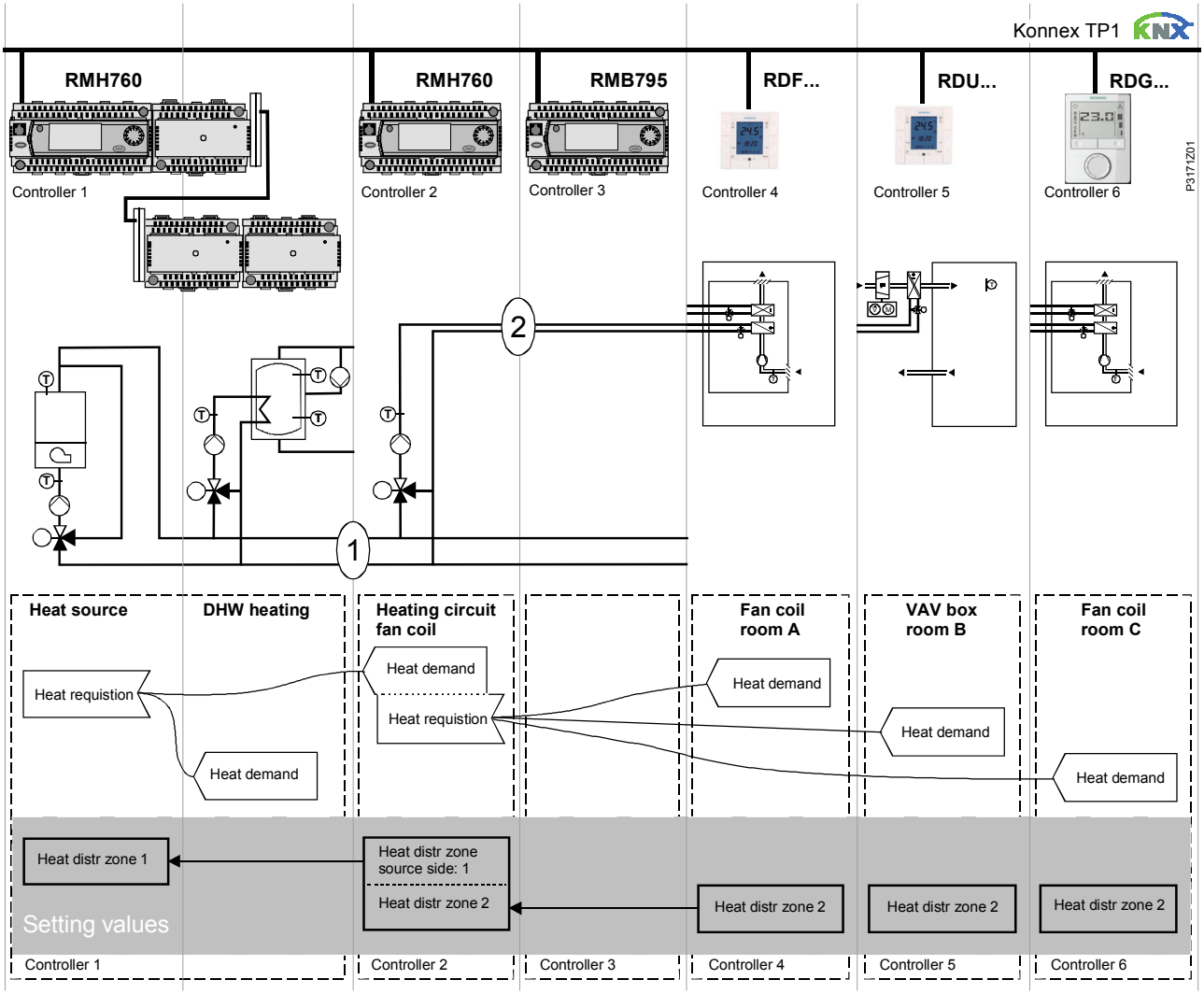
The device will send and receive LTE communication signals only if the zone address is valid (not OSV = out of service).

The zones to be defined are as follows:

Geographical zone (space zone) (Apartment . Room . Subzone) Apartment = ---, 1...126 Room = ---, 1...63 *Subzone = fix 1*	Zone in which an RDG KNX thermostat is physically located. Other room-specific devices may also be located in this zone. Information exchanged in this zone is related specifically to the device like operating mode, setpoints, room temperature, etc. The designations "Apartment", "Room" and "Subzone" do not need to be taken literally. For example, Apartment can be used to refer to a group of rooms, floor or section of a building. ”Room", however, really does refer to a room. Subzone is not used for HVAC devices. It is more relevant to other disciplines, such as lighting. Subzone is fix at “1” and not visible. The time switch information is expected from the same zone where the thermostat is located (Residential). If no time switch information is received from the same zone, the thermostat will use the information received from the same apartment but with room “1“ A.1.1 (Office). **Example:** **Commercial building** In a commercial building, the time switch information is sent by the RMB975 central control unit. The zones are divided in so called “Room groups” (e.g. 1...4), where each “Room group” can have an individual schedule. A room thermostat in the same “Room group” need to have the same Apartment Address. Legend: D = device address (P81) G = geographical zone (P82, P83) (Apartment.Room.Subzone) 
Heat distribution zone heating coil Zone = ---, 1...31	Information related specifically to the hot water system in heating coils is exchanged within this zone. The zone also includes a Synco device to process the information (e.g. RMH7xx or RMU7xx with changeover).
Heat distribution zone heating surface (radiator) Zone = ---, 1...31	Information related specifically to the hot water system of a radiator is exchanged within this zone (e.g. heating demand). This zone also includes a Synco device to process the information (e.g. RMH7xx or RMB7xx).
Refrigeration distribution zone cooling coil Zone = ---, 1...31	Information related specifically to the chilled water system is exchanged within this zone (e.g. cooling demand). This zone also includes a Synco device to process the information (e.g. RMU7xx).
Outside temperature zone *Zone = fix 1*	Outside temperature received in outside temperature zone 1 will be / can be displayed on the room thermostat when commissioned accordingly (parameter P07 = 2).

3.11.4 Example of heating and cooling demand zone

The building is equipped with Synco controls on the generation side and RDF / RDG thermostats on the room side.



Explanation relating to the illustration

In the case of a typical application, the individual RDF / RDG room thermostats – when used with the RMB975 central control unit – signal their heat demand directly to the primary controller (in the above example to the RMH760).

(1) and (2) designate the numbers of the distribution zone.

Notes:

- This type of application can analogously be applied to refrigeration distribution zones
- If no 2-pipe fan coil is used, heat and refrigeration demand signals are sent simultaneously to the primary plant

3.11.5 Send heartbeat and receive timeout

In a KNX network, S-mode and LTE mode communication objects can be exchanged between individual devices. The *Receive timeout* defines the period of time within which all the communication objects requested from a device must have been received at least once. If a communication object is not received within this period, a predefined value is used.

Similarly, the *Send heartbeat* defines the period of time within which all the communication objects requested must be transmitted at least once.

LTE mode / S-mode

Fixed times are specified as follows:

– Receive timeout: 31 minutes
– Send heartbeat: 15 minutes

Reducing the bus load

Individual zones can also be disabled (out of service) via control parameter if they are not being used. In disabled zones, the LTE signal will no longer be periodically sent, and will therefore reduce bus load.

3.11.6 Startup

Startup response

The application is restarted after every reset, so that all the connected motorized valve actuators are synchronized (see "Control outputs", 3.7).

Startup delay

After a reset, it takes up to 5 minutes for all the connected room thermostats to restart. This is designed to avoid overloading the mains power supply when restarting. At the same time, it reduces the load on the KNX network, as not all thermostats transmit data at the same time. The delay ($T_{WaitDevice}$) is determined by the thermostat's device address. After the delay, the device starts to send.

3.11.7 Heating and cooling demand

Heating output primary
Heating output secondary
Cooling output primary
Cooling output secondary

In conjunction with Synco, the heating and/or cooling demand from each room is transmitted to the BACS to provide the required heating or cooling energy.

An example for LTE mode is described in section 3.11.4.

In S-mode, the current state signals of the control outputs are available.

3.11.8 Fault function on KNX

If a fault occurs (e.g. digital fault input, dew point, communication configuration, etc.) then a fault will be sent on the bus.

An RDG thermostat listens on the bus and sends its fault when the fault has the highest alarm priority. This ensures that the management station does not miss any alarms.
If alarms occur at the same time, the alarm with the highest priority will be first displayed and sent on the bus.

Fault transmission is different in LTE mode and S-mode:

S-mode	LTE mode
Fault state	Alarm info (error code + internal information)
Fault information (internal information)	Alarm text (default text can be edited with ACS700 tool)

The table below shows the error code and default alarm texts.

		Thermostat	Fault information on bus		
Prio	**Fault**	**Display**	**Error code**	**Default fault text**	**Text adjustable *)**
-	No fault	---	0	No fault	✓
1	Bus power supply**)	bus	5000	No bus power supply	---
2	Device address error	Addr	6001	>1 id device address	---
3	Condensation		4930	Condensation in the room	✓
4	External fault input X1	AL1	9001	Fault input 1	✓
5	External fault input X2	AL2	9002	Fault input 2	✓
6	External fault input D1	AL3	9003	Fault input 3	✓
7	Clean filter reminder	FIL	3911	Dirty filter	✓

*) Default alarm texts are stored in the thermostat's non-volatile memory and can be adjusted using the ACS700 commissioning tool

**) This error will not be sent on bus (because there is no bus!)

Priority of alarms

- Priority order is #1…7
- External faults #4…6: If faults are active, the display will show AL1, AL2, AL3, alternating. On the bus, only the fault with the highest priority will be sent

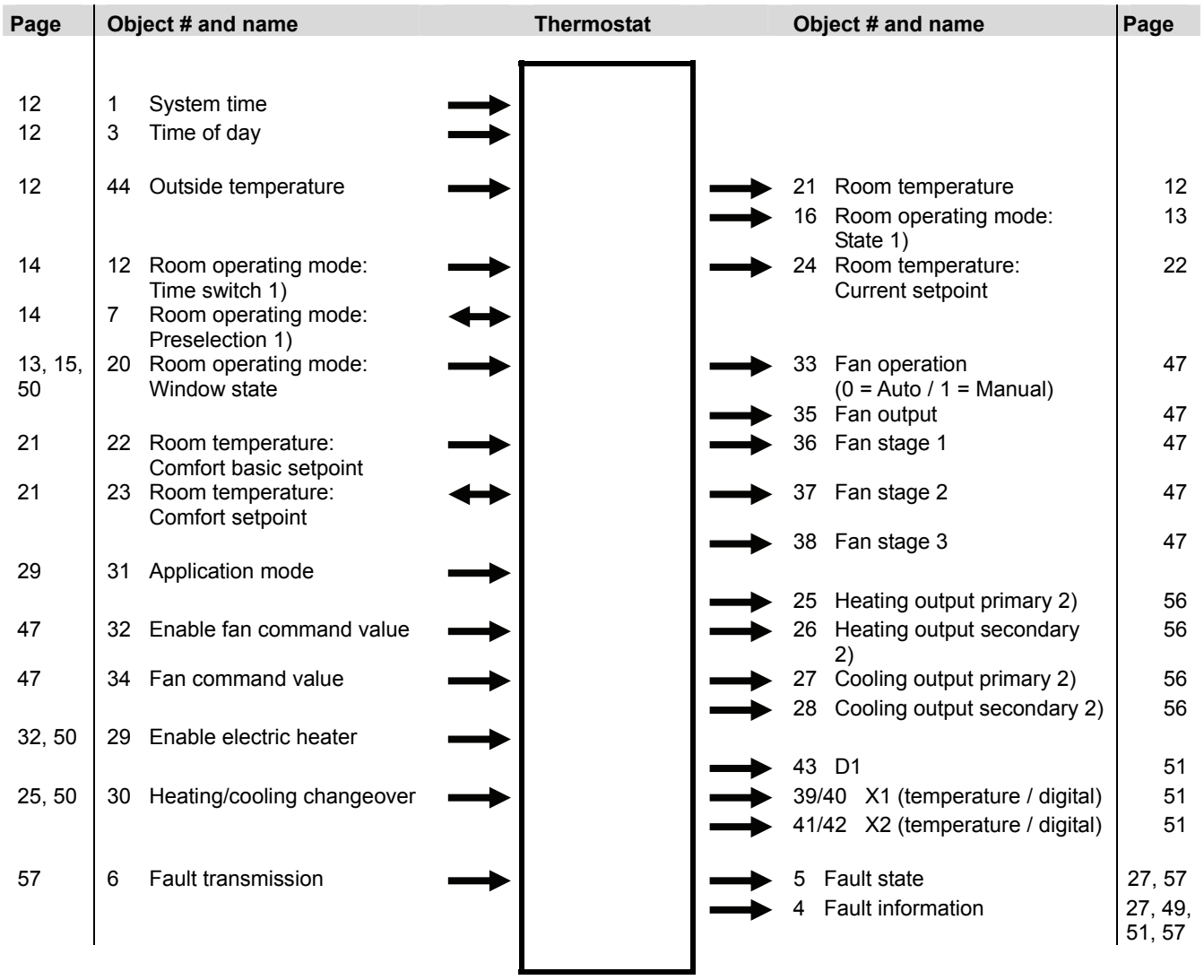
Fault transmission

A supervisor alarm system may command the thermostat to stop sending faults to the bus via the communication object "Fault transmission" (disable / enable).
This has no impact on the local display of faults.

After a timeout of 48 hours, the sending of faults will automatically be enabled again.

3.12 Communication objects (S-mode)

3.12.1 Overview


Page
Object # and name
Thermostat
Object # and name
Page
12 1 System time
12 3 Time of day
12 44 Outside temperature
14 12 Room operating mode: Time switch 1)
14 7 Room operating mode: Preselection 1)
13, 15, 50 20 Room operating mode: Window state
21 22 Room temperature: Comfort basic setpoint
21 23 Room temperature: Comfort setpoint
29 31 Application mode
47 32 Enable fan command value
47 34 Fan command value
32, 50 29 Enable electric heater
25, 50 30 Heating/cooling changeover
57 6 Fault transmission
21 Room temperature 12
16 Room operating mode: State 1) 13
24 Room temperature: Current setpoint 22
33 Fan operation (0 = Auto / 1 = Manual) 47
35 Fan output 47
36 Fan stage 1 47
37 Fan stage 2 47
38 Fan stage 3 47
25 Heating output primary 2) 56
26 Heating output secondary 2) 56
27 Cooling output primary 2) 56
28 Cooling output secondary 2) 56
43 D1 51
39/40 X1 (temperature / digital) 51
41/42 X2 (temperature / digital) 51
5 Fault state 27, 57
4 Fault information 27, 49, 51, 57

Input communication object

Output communication object

Input & output communication object

1) 8-bit and 1-bit object available, selectable via parameter in ETS3

2) Availability depending on selected application / function

3.12.2 Description of communication objects

Obj	Object name	Function	Type/ length	Flags
1	**System time**	Time and date	19.001 8 Byte	CWU
System time for display on the room thermostat. See parameter P07 (3 or 4)				
3	**Time of day**	Time and date	10.001 3 Byte	CWU
Another object for receiving the time of day for display on the room thermostat. See parameter P07 (3 or 4)				
4	**Fault information**	Alarm Info	219.001 6 Byte	CT
Common alarm output. If an alarm occurs, the alarm number is transmitted				
5	**Fault state**	Faulty / normal	1.005 1 bit	CT
Common alarm output. If an alarm occurs, the alarm flag is set				
6	**Fault transmission**	Enable / disable	1.003 1 bit	CWU
A supervisor alarm system can disable the broadcasting of alarms by the devices. This has no impact on the local display of alarms. After a timeout of 48 hours, the sending of faults will automatically be enabled again.				
7	**Room operating mode: Preselection**	Auto Comfort PreComf. Economy Protection	20.102 1 Byte	CWTU
Controls the room operating mode selection of the thermostat via bus. The command can also be submitted as four 1-bit communication objects (8...11). The last interaction wins – either from local operating mode button or via bus. Note: The thermostat will transform Precomfort either into Economy or Comfort (selectable via P88).				
	Operating mode: Preselection	Trigger	1.017 1 bit	CW
8	**Auto**			
9	**Comf**			
10	**Eco**			
11	**Prot**			
Switch room operating mode to either Auto, Comfort, Economy or Protection. The last interaction wins – either from the local operating mode button or via bus.				
12	**Room operating mode: Time switch**	Comfort Economy PreComf. Protection	20.102 1 Byte	CWU
This information is provided by a central time switch or a supervisor and defines the actual HVAC operating mode. The command can also be submitted via three 1-bit communication objects (13...15). Protection has the highest priority and cannot be overridden. Note: The thermostat will transform Precomfort either into Economy or Comfort (selectable P88).				
	Time switch	Trigger	1.017 1 bit	CW
13	**Comfort**			
14	**Economy**			
15	**Protection**			
Switch the HVAC mode to either Comfort, Economy or Protection mode.				

Obj	Object name	Function	Type/ length	Flags
16	**Room operating mode: State**	Comfort Economy Protection	20.102 1 Byte	CRT
Effective room operating mode used by the thermostat (considering time switch, user selection, window contact, etc.) This state information is available via one 8-bit enumeration or three 1-bit communication objects (17...19). Note: The thermostat does not support Precomfort.				
	Room operating mode:	ON OFF	1.002 1 bit	CT
17	**State Comfort**			
18	**State Economy**			
19	**State Protection**			
Corresponding communication object sends "True"				
20	**Window state**	Open Closed	1.019 1 bit	CWU
The thermostat is set to Economy mode if value “1” (open) is received. It switches back to the previous mode when the value is “0” (closed). "Window state" is sent e.g by a KNX switch or a KNX presence detector. It has the same effect as the local operating mode switchover contact X1, X2, D1 (parameter P38, P40, P42). *Only one input source must be used, either local input X1/X2/D1 or KNX bus.*				
21	**Room temperature**	Temp. value	9.001 2 Bytes	CRT
The value of the room temperature measured via built-in or external sensor is available via this communication object.				
22	**Room tempera-ture: Comfort basic setpoint**	Temp. value	9.001 2 Bytes	CWU
If function "Temporary setpoint" is enabled via parameter P69, then after an operating mode change, the setpoint adjustments made by the user and via communication object 23 will be dismissed and the thermostat will be reset to the Comfort basic setpoint. Note: Setpoints that have been changed via the local HMI may be overwritten during a system startup from a central master controller, e.g.RMB795. *The Comfort basic setpoint is stored in EEPROM (see section 3.3.2). → The service life of the EEPROM depends on the number of write cycles. Never write this communication object cyclically!*				
23	**Room temperature: Comfort setpoint**	Temp. value	9.001 2 Bytes	CWTU
Communication object used to shift the setpoint used by the thermostat (see section 3.3.2). Same priority as local setpoint shift on the thermostat. The last intervention wins. Note: The Comfort basic setpoint (object 22) will not be changed.				
24	**Current setpoint**	Temp. value	9.001 2 Bytes	CRT
Current setpoint, including shift, compensation, etc., used by the thermostat for temperature control.				
25	**Heating output primary**	0…100 %	5.001 8 bit	CRT
Indicates the position of the heating actuator of first stage. E.g. 2-pipe with electric heater application: Output of heating coil.				
26	**Heating output secondary**	0…100%	5.001 8 bit	CRT
Indicates the position of the heating actuator of the second stage. E.g. 2-pipe with electric heater application: Output of the electric heater.				

Obj	Object name	Function	Type/ length	Flags
27	**Cooling output primary**	0…100%	5.001 8 bit	CRT
Indicates the position of the cooling actuator of the first stage. E.g. 2-pipe with electric heater application: Output of the cooling coil.				
28	**Cooling output secondary**	0…100%	5.001 8 bit	CRT
Indicates the position of the cooling actuator of the second stage. E.g. 2-stage changeover application: Output of the second cooling stage.				
29	**Enable electric heating**	Enable / disable	1.003 1 bit	CWU
An electric heater can be disabled with this communication object (e.g. to meet tariff regulations). The same function is also available via local multifunctional input X1/X2/D1 (parameter P38, P40, P42). *Only one input source must be used, either local input X1/X2/D1or KNX bus.*				
30	**Heating / cooling changeover**	Heat / Cool	1.100 1 bit	CWU
Changeover information transmitted via bus. Default: Current mode before power down. The same function is also available via local multifunctional input X1/X2/D1 (parameter P38, P40, P42). *Only one input source must be used, either local input X1/X2/D1or KNX bus.*.				
31	**Application mode**	HVAC control mode	20.105 8 bit	CWU

0	Auto (default)	Heating and/or cooling
1	Heat	Heating only
2	Morning warmup*	Heating only
3	Cool	Cooling only
5	Precool*	Cooling only
6	OFF	Neither heating nor cooling
8	Emergency heat*	Heating only
9	Fan only	Fan runs at high speed

** Function handled like Heat (1) or Cool (3)*

32	**Enable fan command value**	Enable Disable	1.003 1 bit	CWU
Set fan mode to Auto (disable) or Manual (enable) by a KNX control unit. If Manual, the value received on *Fan command value (34)* will be used to command the fan speed. Default: Enable The last interaction wins – either from the local fan mode button or via bus.				

Obj	Object name	Function	Type/ length	Flags
33	**Fan operation**	Auto Manual	1.001 1 bit	CRT
Indicates the status of the fan mode: Auto (0) or Manual (1).				
34	**Fan command value**	0…100%	5.001 8 bit	CWU

The fan can be set to a specified speed by a KNX control unit when manual fan operation is enabled.

Speed	Fan command value (physical KNX value)
1	1...33% (1…85)
2	34…67% (86...170)
3	68…100% (171…255)

Fan speed “0” is not supported by the thermostat and the fan speed will remain unchanged.

35	**Fan output**	0…100%	5.001 8 bit	CRT

Indicates the current fan speed as a value 0...100%

Speed	Fan output (physical KNX value)
OFF	0% (0)
1	33% (84)
2	66% (186)
3	100% (255)

36 37 38	**Fan speed 1** **Fan speed 2** **Fan speed 3**	ON OFF	1.001 1 bit	CRT
Indicate the state of the relay outputs				
39 40	**X1: Temperature** **X2: Temperature**	Temp. value	9.001 2 Byte	CRT
Indicate the values of the temperature sensors connected to the local inputs X1 / X2				
41 42 43	**X1: Digital** **X2: Digital** **D1: Digital**	ON OFF	1.001 1 bit	CRT
Indicate the status of the digital inputs (adjusted by parameters P39/P41/P43) including considering of operating action				
44	**Outside temperature**	Temp. value	9.001 2 Byte	CWU
The outside temperature measured by a KNX sensor can be displayed on the thermostat, if parameter P07 "Additional user information” is set = 2 (outside temperature).				

3.13 Control parameters

A number of control parameters can be readjusted to optimize control performance. This can be done on the thermostat via HMI or via commissioning / operating tool. These parameters can also be set during operation without opening the unit.
In the event of a power failure, all control parameter settings are retained.

The control parameters are assigned to 2 levels:
- “Service level”, and
- “Expert level” including communications, diagnostics and test

The “Service level” contains a small set of parameters to set up the thermostat for the HVAC system and to adjust the user interface. These parameters can be adjusted any time.
Change parameters at the “Expert level” carefully, as they impact the thermostat’s control performance and functionality.

3.13.1 Parameter setting via local HMI

Enter only “Service level”

1. Press left and right button simultaneously for >3 seconds, release them, then press the right button for >3 seconds.
   The display shows “P01”.
   Continue with step 2.

Enter “Expert level” and "Diagnostics & test"

1. Press left button and right button simultaneously for >3 seconds, release them, press the left button for >3 seconds, then turn the rotary knob counterclockwise min. ½ rotation.
   The display shows “Pxx”.
   Continue with step 2.

Adjust parameters

2. Select the required parameter by turning the rotary knob.
3. Press button ✔ (OK); the current value of the selected parameter starts blinking and can be changed by turning the rotary knob.
4. Press button ✔ (OK) to confirm the adjusted value or press button ⏏ (Esc) to cancel the change.
5. If you wish to adjust additional parameters, repeat steps 2…4.
6. Press button ⏏ (Esc) to leave the parameter setting mode.

Reset parameters

The factory setting for the control parameters can be reloaded via parameter P71, by changing the value to “ON”. Confirm by pressing the right button.
The display shows “8888” during reloading.

3.13.2 Parameter setting / download via tool

Control parameters can be adjusted via bus either by parameter download during commissioning or during normal operation with a tool like ACS700.

With the ACS700 tool, the parameters can be changed…

ACS Service

– during commissioning via parameter download (all parameters)

ACS Operating

– during normal operation via Popcard (most of the parameters)

OZW772 Web server, RMZ792 bus operator unit

Most parameters can be changed during normal operation using the OZW772 web server or the RMZ792 bus operator unit.

ETS3 Professional

Only the parameters for the device address can be downloaded via ETS3 Professional. This is to simplify and avoid a conflict.
It allows you to further engineer communication objects of an RDG previously commissioned vial local HMI or ACS (assigning communication objects to group addresses).

Notes:

- The basic application can only be changed via parameter download with ACS.
- The RDG KNX thermostats require version ETS3f or higher / ACS700 version 5.11 or higher.

Connecting a KNX tool

Connecting a KNX commissioning / operating tool to the RDG is described in section 4.2.

3.13.3 Parameters of the "Service level"

Parameter	Name	Factory setting	Range
	Service level		
P01	Control sequence	2-pipe: 1 = Cooling only 4-pipe: 4 = Heating and Cooling	0 = Heating only 1 = Cooling only 2 = H/C changeover manual 3 = H/C changeover auto 4 = Heating and Cooling
P02	Operation via room op selector	1	1 = Auto – Protection 2 = Auto - Comfort - Economy - Protection
P03	Operation via fan op selector	0	0 = Auto - Manual 1 = Manual 2 = Auto - Manual - Protection
P04	Unit	C (0)	C = ° Celsius F = ° Fahrenheit
P05	Measured value correction	0 K	– 3 ... 3 K
P06	Standard display	0	0 = Room temperature 1 = Setpoint
P07	Additional display information	0	0 = --- (No display) 1 = °C and °F 2 = Outside temperature (via bus) 3 = Time of day (12h) (via bus) 4 = Time of day (24h) (via bus)
P08	Comfort basic setpoint	21 °C	5 ... 40 °C
P09	Comfort setpoint minimum	5 °C	5 ... 40 °C
P10	Comfort setpoint maximum	35 °C	5 ... 40 °C
P11	Economy heating setpoint	15 °C	OFF, 5 ... WCoolEco; WCoolEco = 40 °C max
P12	Economy cooling setpoint	30 °C	OFF, WHeatEco ... 40 °C; WHeatEco = 5C min
P13	Electric heater when cooling	ON	ON: Enabled OFF: Disabled
P14	Button lock	0	0 = Unlocked 1 = Auto lock 2 = Manual lock

Note: Parameter display depends on selected application and function.

3.13.4 Parameters of the "Expert level with diagnostics and test"

Parameter	Name	Factory setting	Range
	Expert level		
P30	Heat P-band Xp / switching diff	2 K	0.5 … 6 K
P31	Cool P-band Xp / switching diff	1 K	0.5 … 6 K
P32	Radiator P-band Xp / swi diff	2 K	0.5 … 6 K
P33	Dead zone Comfort mode	2 K	0.5 … 5 K
P34	Setpoint differential	2 K	0.5 … 5 K
P35	Integral action time Tn	5 min	0…10 min
P36	H/C ch'over swi point cooling	16 °C	10…25 °C
P37	H/C ch'over swi point heating	28 °C	27…40 °C
P38	Input X1	1: = Ext. sensor	0 = --- (no function) 1 = Room temp ext. sensor / Return air temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact (DI) 4 = Dew point sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital) 8 = Monitor input (Temp)
P39	Normal position input X1	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Close
P40	Input X2	0 = no function	0 = --- (no function) 1 = Room temp ext. sensor / Return air temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact (DI) 4 = Dew point sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital) 8 = Monitor input (Temp)
P41	Normal position input X2	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Close
P42	Input D1	3 = Op mode contact	0 = --- (no function) 2 = H/C changeover (DI) 3 = Operating mode contact (DI) 4 = Dew point sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital)
P43	Normal position input D1	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Close
P44	Actuator running time Y1/Y2	150 s	20…300 sec
P45	Actuator running time Y3/Y4	150 s	20…300 sec
P46	Output Y1/Y2	ON/OFF (1)	0 = 3-position 1 = 2-position 2 = PWM
P47	Output Y3/Y4	ON/OFF (1)	0 = 3-position 1 = 2-position 2 = PWM
P48	On time minimum 2-pos output	1 min.	1...20 min
P49	Off time minimum 2-pos output	1 min.	1...20 min
P50	Purge time	OFF	OFF: Not active 1…5 min: Active with selected duration
P51	Flow temp limit floor heating	OFF	OFF, 10...50 °C
P52	Fan control	1	0 = Disabled 1 = Enabled 2 = Heating only 3 = Cooling only

Parameter	Name	Factory setting	Range
	Expert level		
P53	Fan speeds	3-speed	1 = 1-speed 2 = 3-speed
P54	Fan overrun time	60 sec	0...360 sec
P55	Fan speed switching point high	100%	80...100%
P56	Fan speed switching point med	65%	30..75%
P57	Fan speed switching point low	10%	1...15%
P58	Fan start kick	ON	ON: Enabled OFF: Disabled
P59	On time minimum fan	2 min	1...6 min
P60	Periodic fan kick Comfort	0	0…89 min, OFF(90)
P61	Periodic fan kick Eco	OFF	0…359 min, OFF(360)
P62	Service filter	Off (0)	Off, 100…9900 h
P65	Protection heating setpoint	8 °C	OFF, 5…WCoolProt; WCoolProt = 40 °C max
P66	Protection cooling setpoint	OFF	OFF, WHeatProt… 40; WHeatProt = 5°C min
P67	Fan start delay	0 s	0...180 s
P68	Temporary Comfort mode	0 (= OFF)	0...360 min
P69	Temporary Comfort setpoint	OFF	OFF = Disabled ON = Enabled
P71	Restore factory setting	OFF	OFF = Disabled ON = Reload start “8888” is displayed for 3s during reload process

Parameter	Name	Factory setting	Range
	Communications		
P81	Device address 1)	255	1…255
P82	Geographical zone (apartment) 2)	---	---, 1...126
P83	Geographical zone (room) 2)	1	---, 1...63
P84	Heat distr zone heating coil	---	---, 1...31
P85	Refrig distr zone cooling coil	---	---, 1...31
P86	Heat distr zone heating surface	---	---, 1...31
P88	Transformation Precomfort	0	0 = Economy 1 = Comfort

Note: P46, P47: Setting to 2-position or 3-position is made with DIP switches 4 and 5

1) Physical address = Area.Line.DeviceAddress. Factory setting of Area = 0, Line = 2.
Can be changed by special management service e.g. from line coupler or via ACS commissioning tool.
2) Type = geographical zone A.R.S. In RDG sub zone = fixed value 1

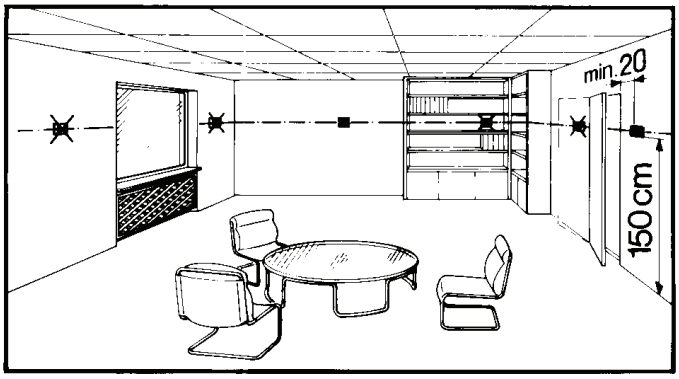
Parameter	Name	Range
	Diagnostics & test	
d01	Application number	0 = (No application) 1 = 2-pipe 2 = 2-pipe with electric heater 3 = 2-pipe with radiator 4 = 4-pipe 5 = 2-stage heating or cooling 6 = 4-pipe with electric heater
d02	X1 state	0 = Not activated (for DI) 1 = Activated (DI) 0…49 °C = Current temp. value (for AI) 00 = H/C Input shorted 100 = H/C Input open
d03	X2 state	0 = Not activated (for DI) 1 = Activated (DI) 0…49 °C = Current temp. value (for AI) 00 = H/C Input shorted 100 = H/C Input open
d04	D1 state	0 = Not activated (for DI) 1 = Activated (DI) 00 = H/C Input shorted 100 = H/C Input open
d05	Test mode for checking the Y1/Y2 actuator's running direction 3)	"---" = no signal on outputs Y1 and Y2 OPE = output Y1 forced opening CLO = output Y2 forced closing
d06	Test mode for checking the Y3/Y4 actuator's running direction 3)	"---" = no signal on outputs Y3 and Y4 OPE = output Y3 forced opening CLO = output Y4 forced closing
d07	Software version	Ux.xx is displayed

3) This parameter can only be quit when the setting is back at “---”.
Press the left button to escape.

4. Handling

4.1 Mounting and installation

Do not mount on a wall in niches or bookshelves, behind curtains, above or near heat sources, or exposed to direct solar radiation. Mount about 1.5 m above the floor.



Mounting

- Mount the room thermostat in a clean, dry indoor place without direct airflow from a heating / cooling device, and not exposed to dripping or splash water

Wiring

See Mounting Instructions M3191 [3] enclosed with the thermostat.

- Comply with local regulations to wire, fuse and earth the thermostat
- Properly size the cables to the thermostat, fan and valve actuators for AC 230 V mains voltage
- Use only valve actuators rated for AC 230 V
- The AC 230 V mains supply line must have an external fuse or circuit breaker with a rated current of no more than 10 A
- Isolate the cables of input D1-GND for 230 V if the conduit box carries AC 230 V mains voltage
- Inputs X1-M, X2-M or D1-GND: Several switches (e.g. summer / winter switch) may be connected in parallel. Consider overall maximum contact sensing current for switch rating
- Inputs X1-M and X2-M carry mains potential.
  Sensor cables must be suited for AC 230 V mains voltage
- Isolate the cables of KNX communication input CE+ / CE- for AC 230 V if the conduit box carries AC 230 V mains voltage
- No cables provided with a metal sheath
- Disconnect from supply before removing from the mounting plate

4.2 Commissioning

Applications

The room thermostats are delivered with a fixed set of applications.

Select and activate the relevant application during commissioning using one of the following tools:

– Local DIP switch and HMI
– Synco ACS
– ETS3 Professional
(*Parameter and application download with ETS3 will be implemented later)*

DIP switches

Set the DIP switches before snapping the thermostat to the mounting plate, if you want to select an application via **DIP switches**.

All DIP switches need to be set to “OFF” (remote configuration), if you want to select an application via **commissioning tool**.

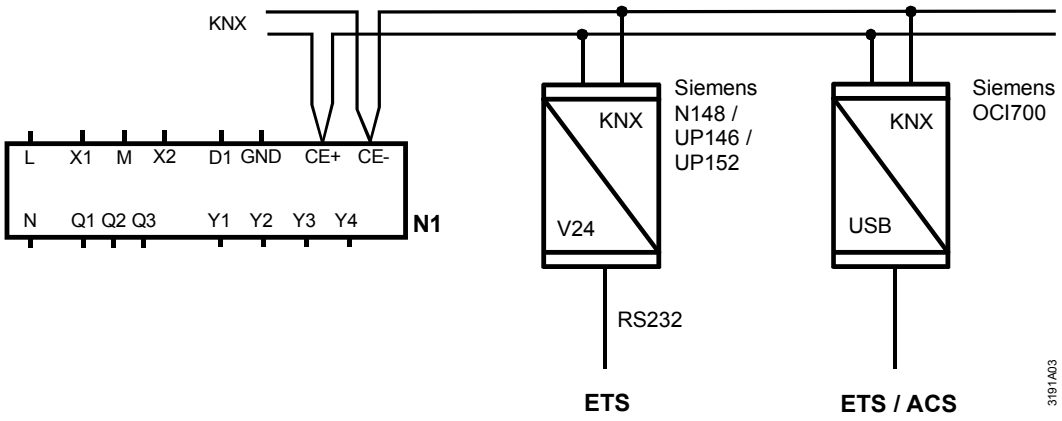
After power is applied, the thermostat resets and all LCD segments flash, indicating that the reset was correct. After the reset, which takes about 3 seconds, the thermostat is ready for commissioning by qualified HVAC staff.

If all DIP switches are OFF, the display reads "NO APPL" to indicate that application commissioning via a tool is required.

Note: Each time the application is changed, the thermostat reloads the factory setting for all control parameters, except for KNX device and zone addresses!

Connect tool

Connect the Synco ACS or ETS3 Professional tools to the KNX bus cable at any point for commissioning:



ACS and ETS3 require an interface:

– RS232 KNX interface (e.g. Siemens N148 / UP146 / UP152)
– OCI700.1 USB-KNX interface

Note: An external KNX bus power supply is required if an RDG is connected directly to a tool (ACS700 or ETS3) via KNX interface.

Control parameters

The thermostat's control parameters can be set to ensure optimum performance of the entire system.
The parameters can be adjusted using
– Local HMI
– Synco ACS
– ETS3 Professional
  Parameter and application download with ETS3 will be implemented later.

The control parameters of the thermostat can be set to ensure optimum performance of the entire system (see section 3.13, control parameters).

Control sequence

- The control sequence may need to be set via parameter P01 depending on the application. The factory setting is as follows:

Application	Factory setting P01
2-pipe and chilled / heated ceiling, and 2-stage	1 = cooling only
4-pipe, chilled ceiling and radiator	4 = heating and cooling

Calibrate sensor

- Recalibrate the temperature sensor if the room temperature displayed on the thermostat does not match the room temperature measured (after min. 1 hour of operation). To do this, change parameter P05

Setpoint and range limitation

- We recommend to review the setpoints and setpoint ranges (parameters P08…P12) and change them as needed to achieve maximum comfort and save energy

Programming mode

The programming mode helps identify the thermostat in the KNX network during commissioning.
Press left and right buttons simultaneously for 6 seconds to activate programming mode, which is indicated on the display with "PrO9".
Programming mode remains active until thermostat identification is complete.

Assign KNX group addresses

Use ETS3 Professional to assign the KNX group addresses of the thermostat's communication objects.

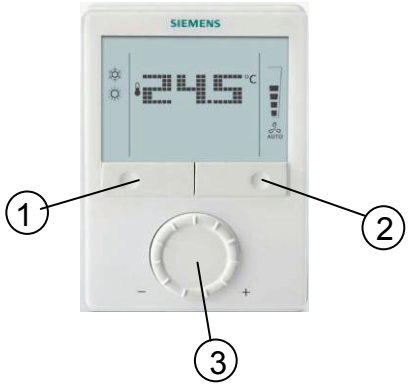
KNX serial number

Each device has a unique KNX serial number at the rear. An additional sticker with the same KNX serial number is enclosed in the packaging box. This sticker is intended for installers for documentation purposes.

4.3 Operation

See also Operating Instructions B3191 [2] enclosed with the thermostat.

Layout

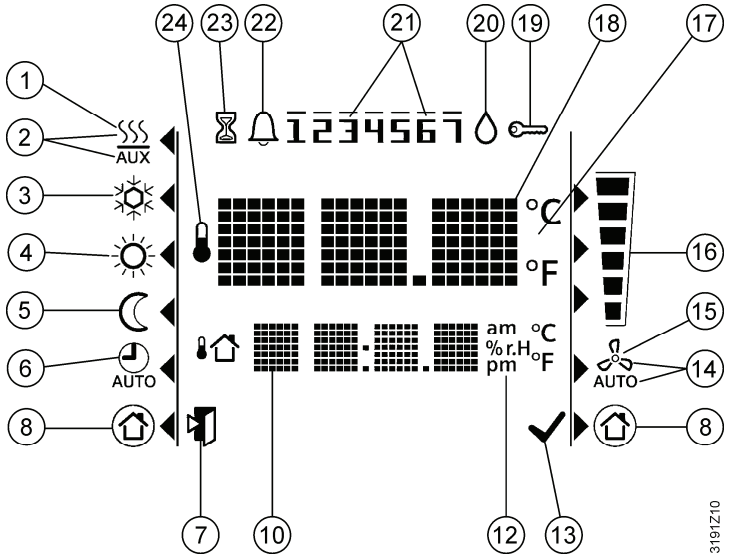


1. Operating mode selector / Esc
2. Fan mode selector / Ok
3. Rotary knob to adjust setpoints and parameters

Button operation

User action	Effect, description
Normal operation	Actual operating mode and state are indicated by symbols
Press any button (thermostat in normal operation)	Enter operating mode selection; backlit LCD turns on, all possible mode symbols turn on, indicator element (arrow) will appear on the current mode / state
Press left button	Change operating mode (indicator element (arrow) changes to the next mode symbol. After the last press and a timeout of 3 seconds, the newly selected mode is confirmed, the other elements disappear. After a timeout of 20 seconds, the LCD backlight turns off
Press left button (P01 = 2)	Toggle between heating and cooling
Press left button while "Operating mode" via bus is Economy or while operating mode switchover contact is activated	Activate "Extend Comfort mode" (for details, see page 16)
Keep left button depressed and turn rotary knob clockwise / counter-clockwise	Activate timer "Extend presence" / "Extend absence" and set the time (for details, see page 16)
Press right button >3 seconds	Activate / deactivate button lock
Press right button for fan coil unit	Change fan mode
Press right button if P52 = 0 (fan disabled, e.g. in chilled ceiling applications)	Set thermostat to Protection mode
Turn rotary knob	Adjust the room temperature Comfort setpoint
Press left and right button >3 seconds, release, then press right button >3 seconds	Enter parameter setting mode “Service level”
Press left and right button for 3 seconds, release, press left button for 3 seconds, then turn rotary knob counterclockwise min. ½ revolution	Enter parameter setting mode “Expert level”, diagnostics and test
Press left and right button simultaneously for 6 seconds	Enter (KNX) programming mode

Display



#	Symbol	Description	#	Symbol	Description		
1		Heating mode	14	AUTO	Automatic fan		
2	AUX	Heating mode, electric heater active	15		Manual fan		
3		Cooling mode	16		Fan speed		Fan speed 1
4		Comfort					Fan speed 2
5		Economy					Fan speed 3
6	AUTO	Auto Timer mode according to schedule (via bus)	17	°C °F	Degrees Celsius Degrees Fahrenheit		
8		Protection mode	18		Digits for room temperature and setpoint display		
9		Escape	19		Button lock		
10		Additional user information, like outside temperature or time of day from KNX bus. Selectable via parameters	20		Condensation in room (dew point sensor active)		
12	am pm	Morning: 12-hour format Afternoon: 12-hour format	21	1234567	Weekday 1…7 from KNX bus 1 = Monday / 7 = Sunday		
13		Confirmation of parameters	22		Fault		
			23		“Temporary timer” function; visible when operating mode is temporarily extended (extended presence or absence)		
			24		Indicates that room temperature is displayed		

4.4 Remote operation

The RDG thermostats can be operated from a remote location using a OZW772 / OZW775 web server, a RMZ792 bus operating unit or the ACS Operating tool.

4.5 Disposal

The device is classified as waste electronic equipment in terms of the European Directive 2002/96/EC (WEEE) and should not be disposed of as unsorted municipal waste.

The relevant national legal rules must be adhered to.
Regarding disposal, use the systems setup for collecting electronic waste.

Observe all local and applicable laws.

5. Supported KNX tools

5.1 ETS3 Professional

ETS3 Professional

ETS3 Professional is an engineering tool. It is used to set up the communication of the RDG KNX thermostat and assigns the communication object to group addresses (S-mode).

Parameters are only used for choosing (making visible / hiding) the communication objects.

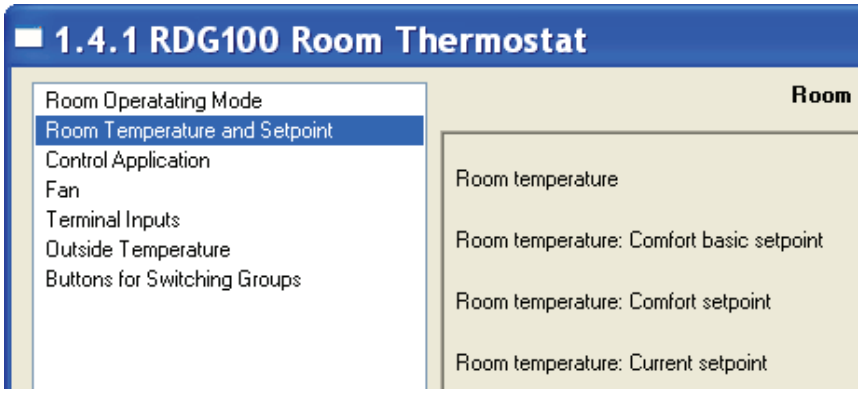
This Manual does not describe how to operate ETS3 Professional and commission a device. Refer to the KNX Manual for more details.

Note!

Setting RDG KNX parameters is only supported by ETS3f or higher.

5.1.1 Parameter settings in ETS Professional

For setting the parameters, open the project and select a device.
To start the parameter settings, select **Edit,** then **Edit parameters**.



Note

- Parameters are only used to choose the communication objects
- The tool required is ETS3 Professional version 3f or higher!

5.2 ACS700 Service and Operating tool

ACS Service

ACS Operating

With the ACS700 tools, the RDG KNX thermostats can be commissioned (physical address, application, parameters). They can be operated or monitored via bus during normal operation.

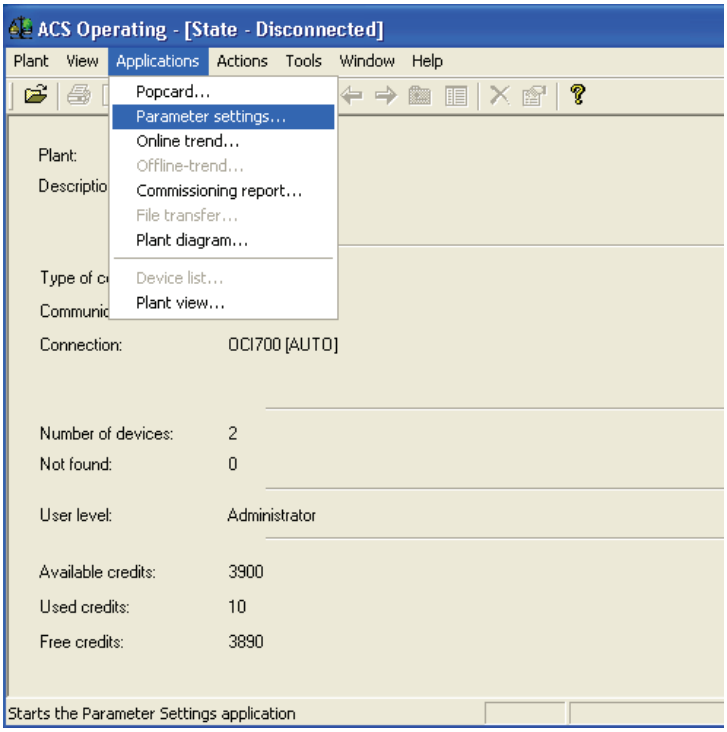
This Manual does not describe how the physical address is defined. Also, it only gives a brief overview of the main functionality of ACS.
For more information, refer to the ACS online help.

Note!

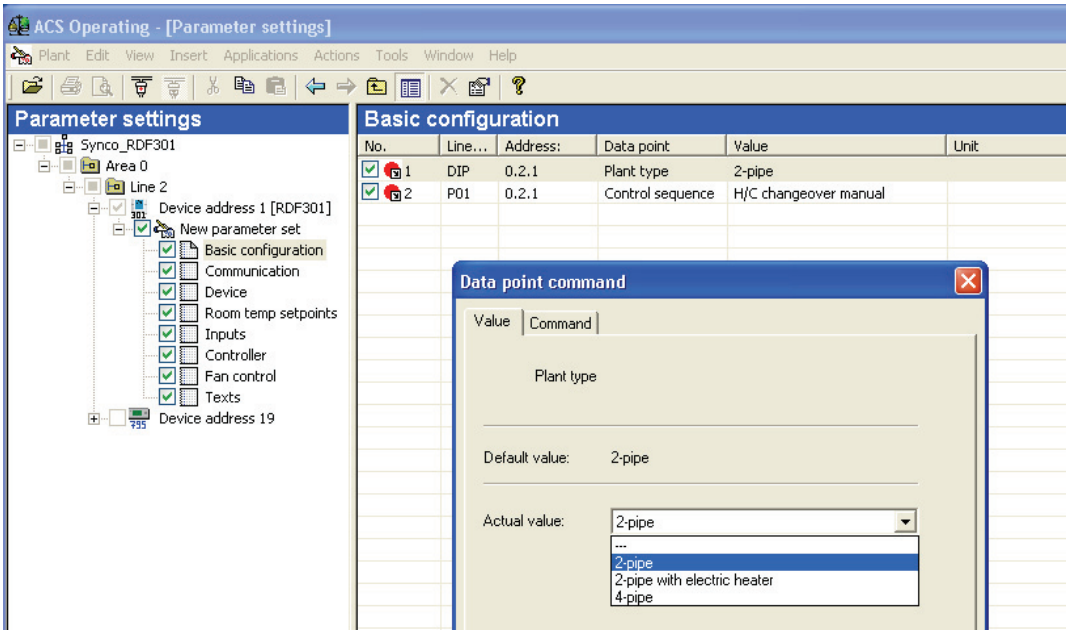
Setting RDG KNX parameters is only supported by ACS700 Version 5.11 or higher.

5.2.1 Parameter settings in ACS

In the **ACS Service** program, select **Plant,** then **Open** to open the plant.
To start the parameter settings, select **Applications,** then **Parameter settings…**:



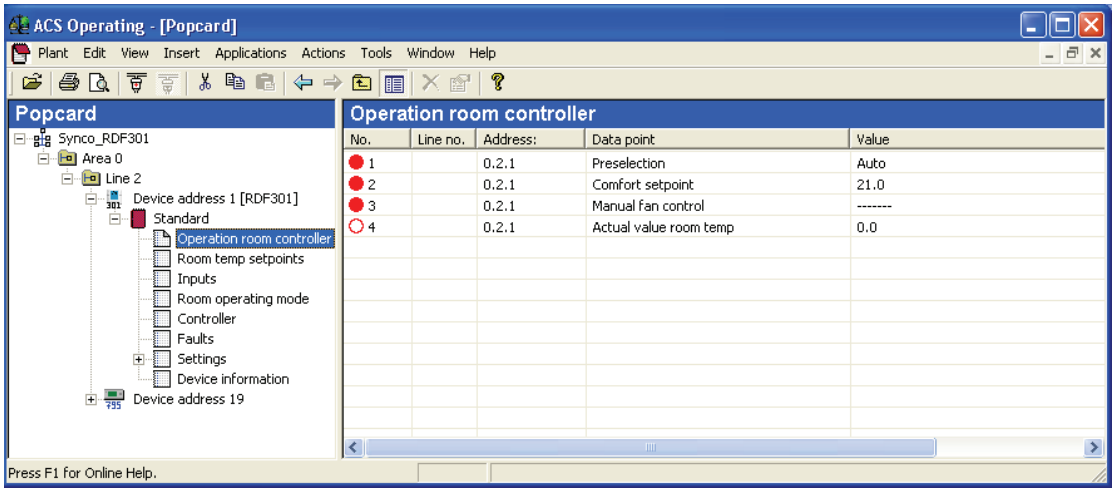
The **application** and **control parameters** can be adjusted and downloaded.
Column *Line no.* contains the parameter number as shown in the parameter table.
Refer to section 3.13, control parameters.



5.2.2 Operation and monitoring with ACS

ACS Operating

In the **ACS Operating** program, select **Plant,** then **Open** to open the plant.
To start monitoring and operation, select **Applications,** then **Popcard**

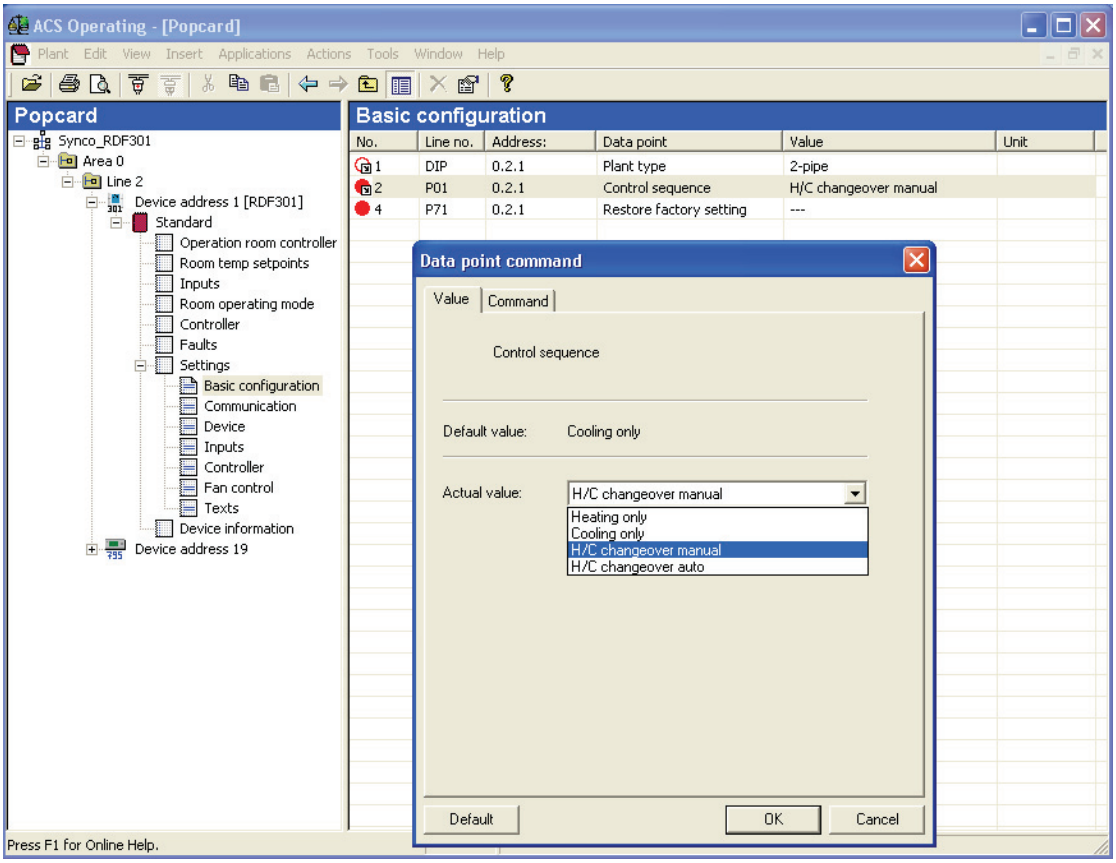


Parameter settings in ACS Operating

ACS Operating supports parameter settings even during normal operation.

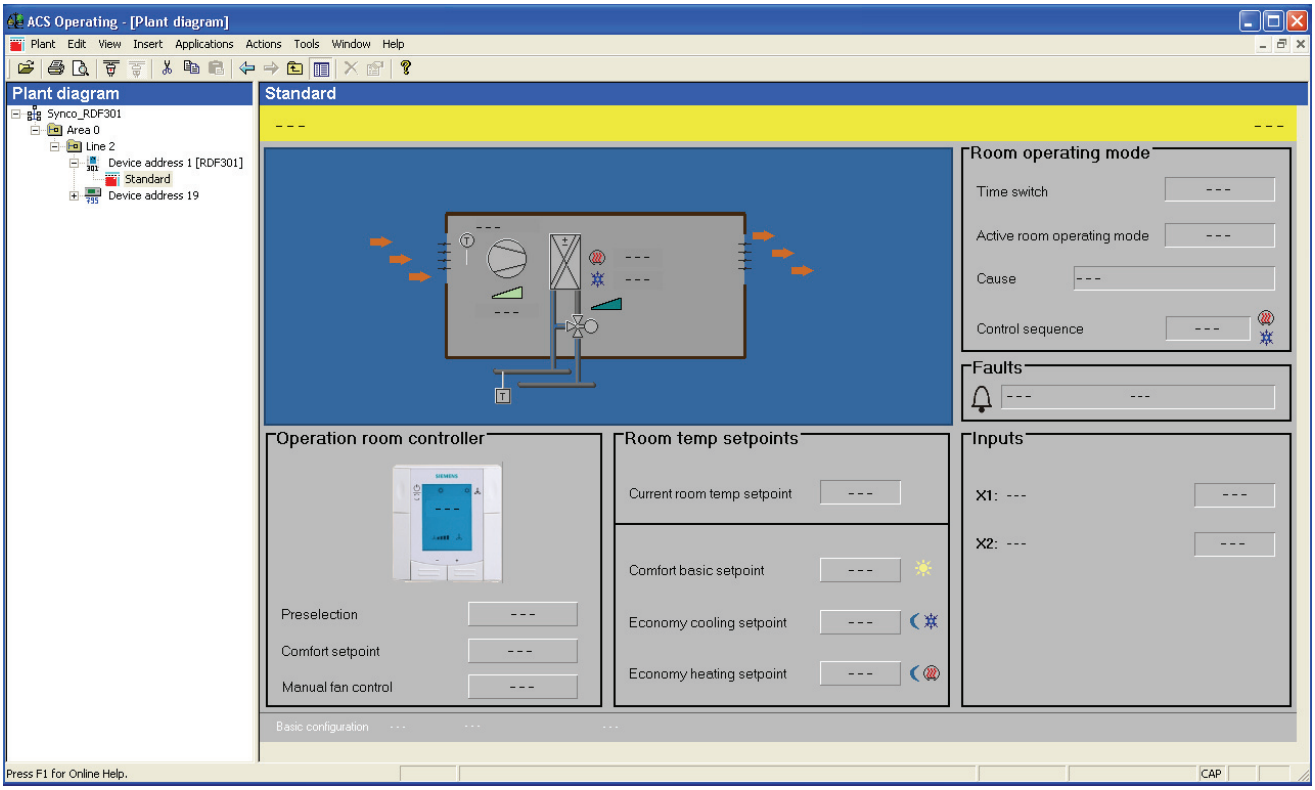
To change a control parameter, select **Popcard,** then **Settings**.

Notes:
- Make sure you have logged on with sufficient access right
- Only control parameter can be changed, no application!

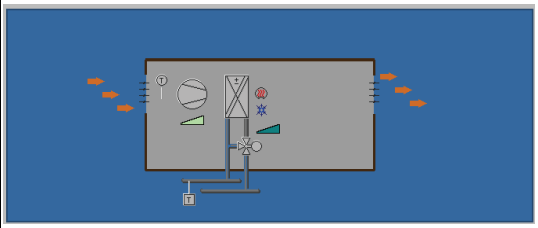
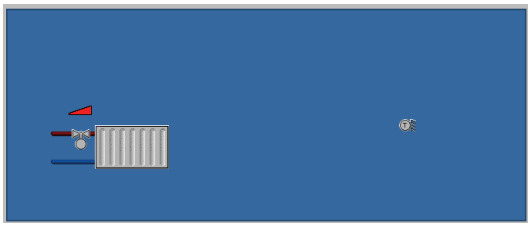
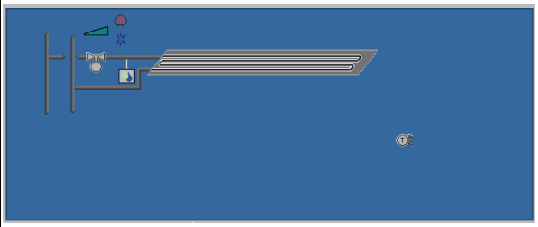
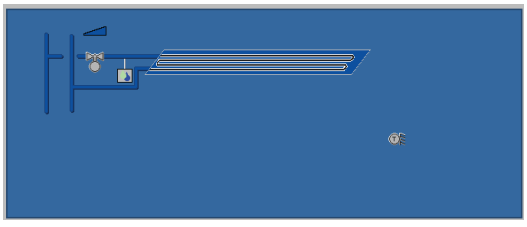


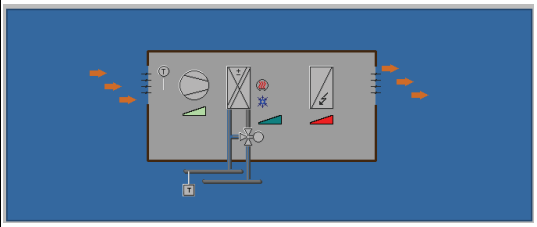
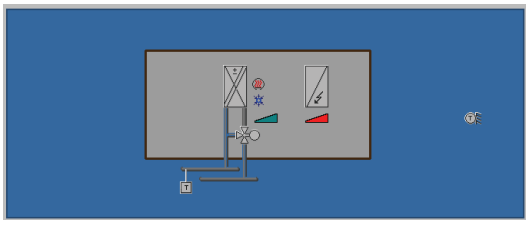
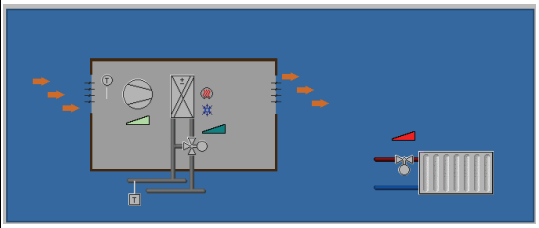
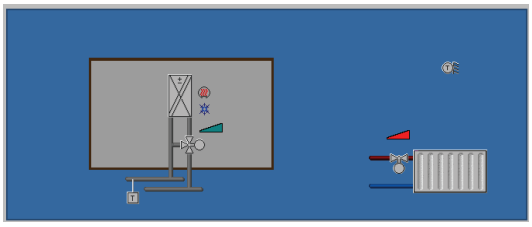
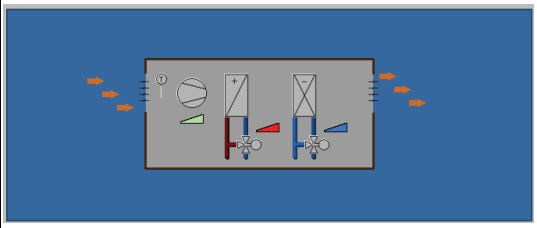
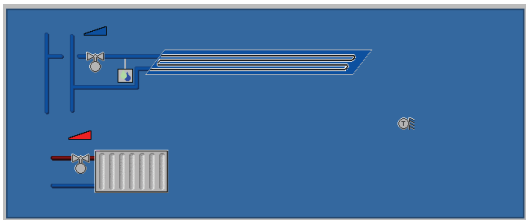
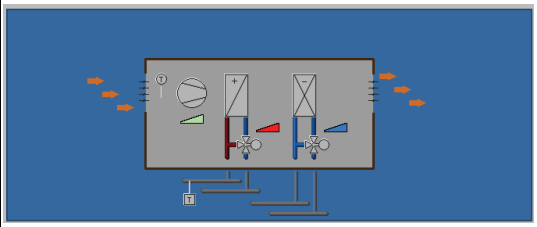
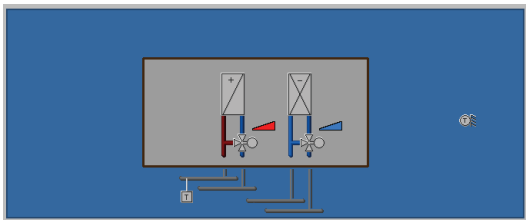
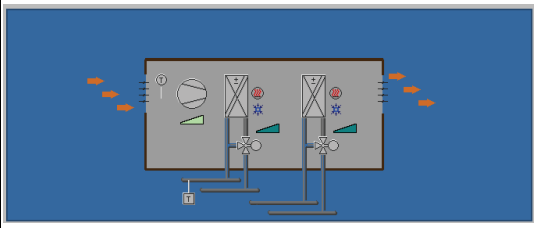
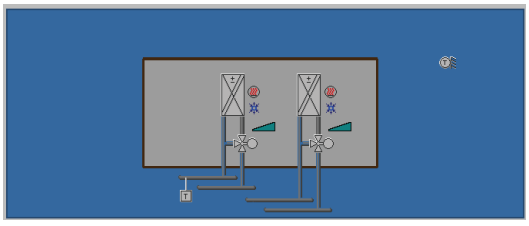
Plant diagram in ACS Operating

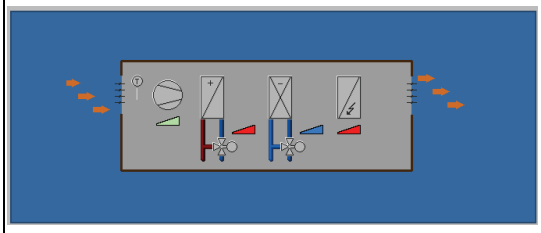
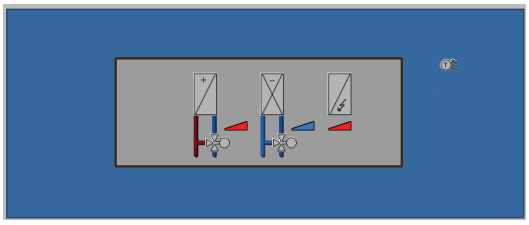
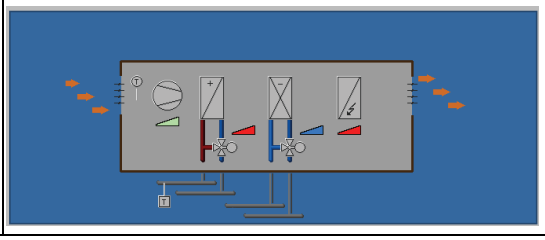
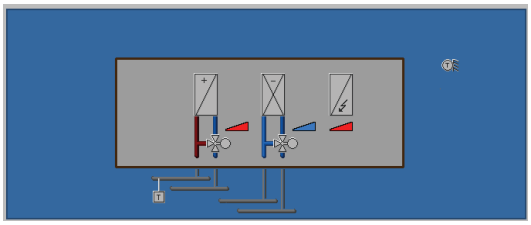
ACS Operating offers plant diagrams for easy monitoring and operation of the thermostat.
To start this application, select **Applications,** then **Pant diagram**



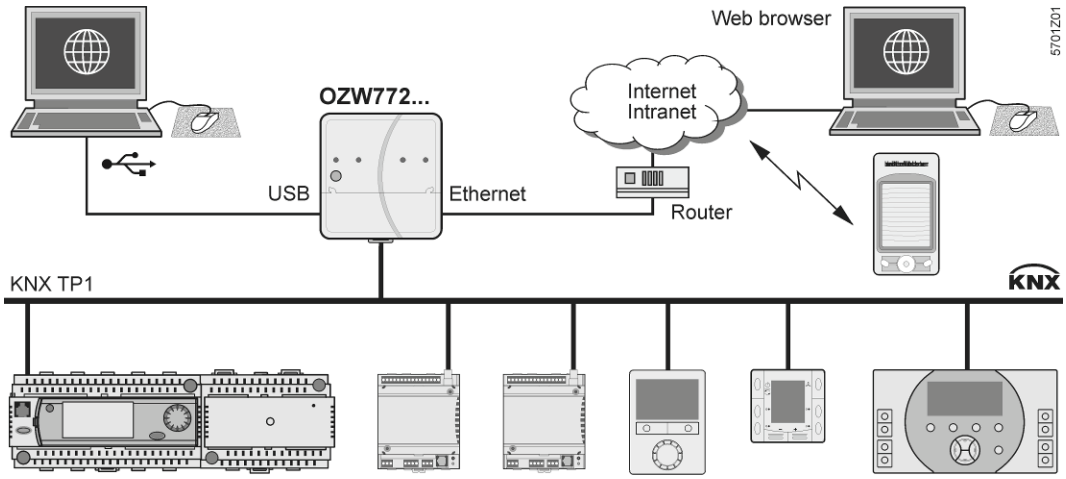
ACS provides standard plant diagrams for RDG KNX thermostats, which depend on the configuration as follows:

Plant type	**Application** *Configuration*	**Application** *Configuration*
2-pipe	**2-pipe fan coil unit** *– Control sequence: No impact (P01 = any)* *– Fan operation: Not disabled (P52 <> 0)* 	**Radiator** *– Control sequence: Heating only (P01 = 0)* *– Fan operation: Disabled (P52 = 0)* 
	Chilled / heated ceiling *– Control sequence: Changeover (P01 = 2,3)* *– Fan operation: Disabled (P52 = 0)* 	**Chilled ceiling** *– Control sequence: Cooling only (P01 = 1)* *– Fan operation: Disabled (P52 = 0)* 

Plant type	Application *Configuration*	Application *Configuration*
2-pipe and electric heater	**2-pipe fan coil unit with electric heater** *– Control sequence: No impact (P01 = any)* *– Fan operation: Not disabled (P52 <> 0)* 	**Single stage with electric heater** *– Control sequence: No impact (P01 =any)* *– Fan operation: Disabled (P52 = 0)* 
2-pipe and radiator	**2-pipe fan coil unit with radiator** *– Control sequence: No impact (P01 = any)* *– Fan operation: Not disabled (P52 <> 0)* 	**Single stage with radiator** *– Control sequence: No impact (P01 =any)* *– Fan operation: Not disabled (P52 <> 0)* 
4-pipe	**4-pipe fan coil unit** *– Control sequence: Not auto c/o (P01 <> 3)* *– Fan operation: Not disabled (P52 <> 0)* 	**Chilled ceiling with radiator** *– Control sequence: No impact (P01 =any)* *– Fan operation: Disabled (P52 = 0)* 
	Fan coil unit main / secondary *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Not disabled (P52 <> 0)* 	**Main / secondary** *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Disabled (P52 = 0)* 
2-stage heating or cooling	**2-stage fan coil unit** *– Control sequence: No impact (P01 = any)* *– Fan operation: Not disabled (P52 <> 0)* 	**2-stage** *– Control sequence: No impact (P01 =any)* *– Fan operation: Not disabled (P52 = 0)* 

Plant type	Application *Configuration*	Application *Configuration*
4-pipe with el heater	**4-pipe fan coil unit with electric heater** *– Control sequence: Not auto c/o (P01 <> 3)* *– Fan operation: Not disabled (P52 <> 0)* 	**1 stage Heat and Cool with electric heater** *– Control sequence: No impact (P01 <> 3)* *– Fan operation: Disabled (P52 = 0)* 
	Fan coil unit main / secondary with electric heater *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Not disabled (P52 <> 0)* 	**Main / secondary with el heater** *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Disabled (P52 = 0)* 

5.2.3 Operation and monitoring with OZW772



The OZW772 web server enables users to operate a Synco HVAC system from a remote location – via PC or from a smart phone via the web. A start page shows the most important data points. A combination of menu / path navigation enables users to access all data points quickly and straightforwardly. The entire installation can be visualized in the form of plant diagrams. Alarm and state messages can be forwarded to different message receivers, such as e-mail, SMS, etc.

For details, see Commissioning Instructions CE1C5701.

5.2.4 Operation and monitoring with RMZ972

The RMZ792 is a communicating operator unit designed for operating Synco™ 700 and RDG KNX devices in a KNX network.
The operator unit is suited both for fixed installation and mobile use (e.g. for use by the service engineer).
Third-party devices cannot be operated with it.

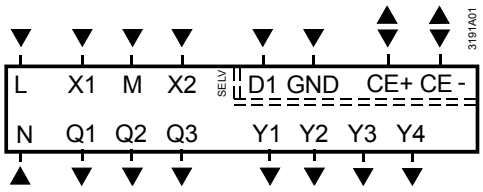
For details, see Basic Documentation CE1P3113.

Note: The application cannot be displayed in the form of text, instead a number is used: (Parameter **Plant type** on menu **Basic setting)**:

0 = no application
1 = 2-pipe
2 = 2-pipe and electric heater
3 = 2-pipe and radiator
4 = 4-pipe
5 = 2-stage
6 = 4-pipe and electric heater

6. Connection

6.1 Connection terminals

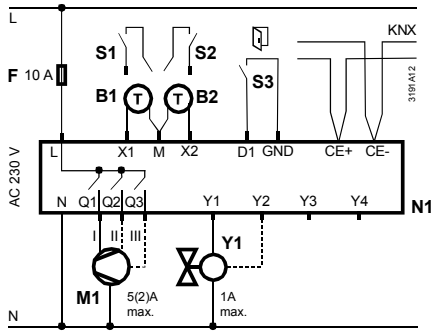


L, N	Operating voltage AC 230 V
X1, X2	Multifunctional input for temperature sensor (e.g. QAH11.1) or potential-free switch Factory setting: – X1 = External temperature sensor – X2 = No function (function can be selected via parameters P38 / P40).
M	Measuring neutral for sensors and switches
D1, GND	Multifunctional input for potential-free switch Factory setting: Operating mode switchover contact (function can be selected via parameter P42).
Q1	Control output fan speed “low” AC 230 V
Q2	Control output fan speed “medium” AC 230 V
Q3	Control output fan speed “high” AC 230 V
Y1…Y4	Control output “Valve” AC 230 V (NO contact, for normally closed valves), output for electric heater via external relay
CE+	KNX data +
CE-	KNX data –

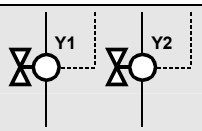
6.2 Connection diagrams

Application

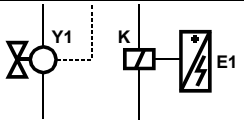
- 2-pipe



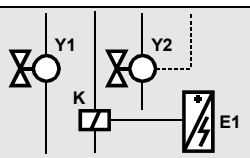
- 2-pipe and radiator
- 4-pipe
- 2-stage



- 2-pipe and electric heater



- 4-pipe and electric heater



N1	Room thermostat RDG100KN
M1	1- or 3-speed fan
V1, V2	Valve actuators: ON/OFF or PWM, 3-position, heating, cooling, radiator, heating / cooling, 1st or 2nd stage
E1	Electric heater
K	Relay
F	External fuse
S1, S2	Switch (keycard, window contact, presence detector, etc.)
S3	Switch at SELV input (keycard, window contact)
B1, B2	Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)
CE+	KNX data +
CE–	KNX data –

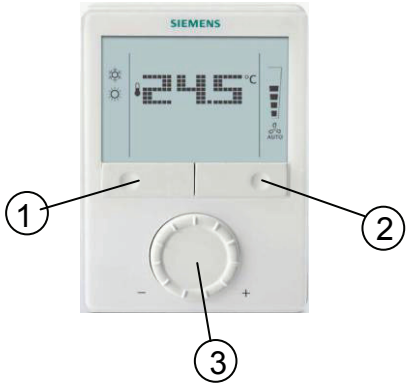
7. Mechanical design

7.1 General

The room thermostat consists of 2 parts:

- Plastic housing with electronics, operating elements and room temperature sensor
- Mounting plate with the screw terminals

The housing engages in the mounting plate and is secured with 2 screws.

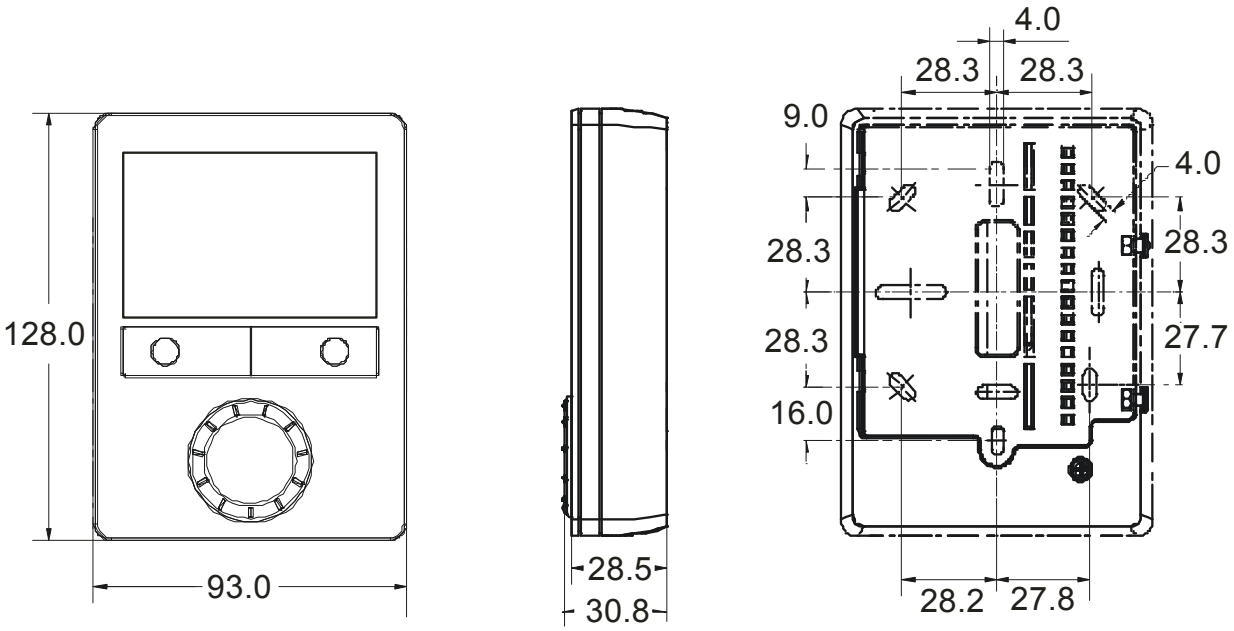


1. Operating mode selector / Esc
2. Fan mode selector / Ok
3. Rotary knob to adjust setpoints and parameters

For operation, refer to section 4.3.

7.2 Dimensions

Dimensions in mm



8. Technical data

⚠ Power supply	Operating voltage		AC 230 V +10/-15%
	Frequency		50/60 Hz
	Power consumption		Max. 15 VA / 2 W
Outputs	Fan control Q1, Q2, Q3-N		AC 230 V
	Rating		Max. 5(4) A
	Control outputs		Solid state (triac)
	Y1, Y2, Y3, Y4-N		AC 230 V, max. 1 A
Inputs	Multifunctional inputs		
	X1-M / X2-M		
	Temperature sensor input		
	Type		QAH11.1 (NTC)
	Digital input		
	Operating action		Selectable (NO/NC)
	Contact sensing		DC 0…5 V, max. 5 mA
	Insulation against mains		N/A, mains potential ⚠
	D1-GND		
	Operating action		Selectable (NO/NC)
	Contact sensing		SELV DC 6…15 V, 3…6 mA
	Insulation against mains		3.75 kV, reinforced insulation
	Function of inputs		Selectable
	External temperature sensor, heating/cooling changeover sensor, operating mode switchover contact, dew point monitor contact, enable electric heater contact, fault contact, monitoring input		X1: P38 X2: P40 D1: P42
KNX bus	Interface type		KNX, TP1-64 (electrically isolated)
	Bus current		20 mA
	Bus topology: See KNX Manual (see 1.2 “Reference documents”)		
Operational data	Switching differential (adjustable)		
	Heating mode	(P30)	2 K (0.5…6 K)
	Cooling mode	(P31)	1 K (0.5…6 K)
	Setpoint setting and setpoint range		
	☼ Comfort	(P08)	21 °C (5…40 °C)
	☾ Economy	(P11-P12)	15 °C/30 °C (OFF, 5…40 °C)
	⌂ Protection	(P65-P66)	8 °C/OFF (OFF, 5…40 °C)
	Multifunctional inputs X1 / X2 / D1		Selectable (0...8)
	Input X1 default value	(P38)	1 (ext. temperature sensor, room or return air)
	Input X2 default value	(P40)	0 (no function)
	Input D1 default value	(P42)	3 (operating mode switchover)
	Built-in room temperature sensor		
	Measuring range		0…49 °C
	Accuracy at 25 °C		< ± 0.5 K
	Temperature calibration range		± 3.0 K
	Settings and display resolution		
	Setpoints		0.5 °C
	Current temperature value displayed		0.5 °C

Environmental conditions	Operation	IEC 721-3-3
	Climatic conditions	Class 3K5
	Temperature	0…50 °C
	Humidity	<95% r.h.
	Transport	IEC 721-3-2
	Climatic conditions	Class 2K3
	Temperature	−25…60 °C
	Humidity	<95% r.h.
	Mechanical conditions	Class 2M2
	Storage	IEC 721-3-1
	Climatic conditions	Class 1K3
	Temperature	−25…60 °C
	Humidity	<95% r.h.
Standards and directives	CE conformity	
	EMC directive	2004/108/EC
	Low-voltage directive	2006/95/EC
	C-tick conformity to EMC emission standard	AS/NZS 61000.6.3: 2007
	RoHS 2002/95/EC — Reduction of hazardous substances	2002/95/EC
	Product standards	
	Automatic electric controls for household and similar use	EN 60730–1
	Special requirements for temperature-dependent controls	EN 60730–2-9
	Electronic control type	2.B (micro-disconnection on operation)
	Home and Building Electronic Systems	EN 50090-2-2
	Electromagnetic compatibility	
	Emissions	IEC/EN 61000-6-3
	Immunity	IEC/EN 61000-6-2
	Safety class	II as per EN 60730
	Pollution class	Normal
	Degree of protection of housing	IP30 as per EN 60529
General	Connection terminals	Solid wires or stranded wires with ferrules 1 x 0.4…2.5 mm^2 or 2 x 0.4…1.5 mm^2
	Housing front color	RAL 9003 white
	Weight without / with packaging	0.377 kg / 0.400kg

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